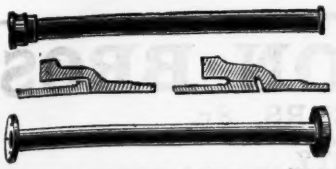
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVII. No. 1716.] LONDON, MARCH 31, 1896. [48TH YEAR. PRICE 6d.

GAS AND WATER PIPES
1¼ to 12 IN. BORE.



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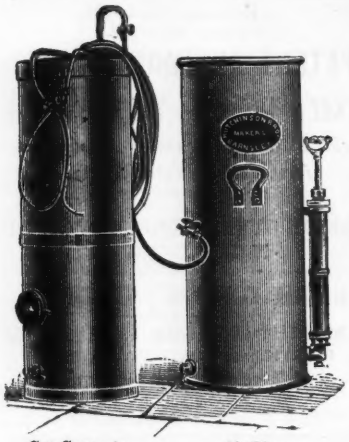

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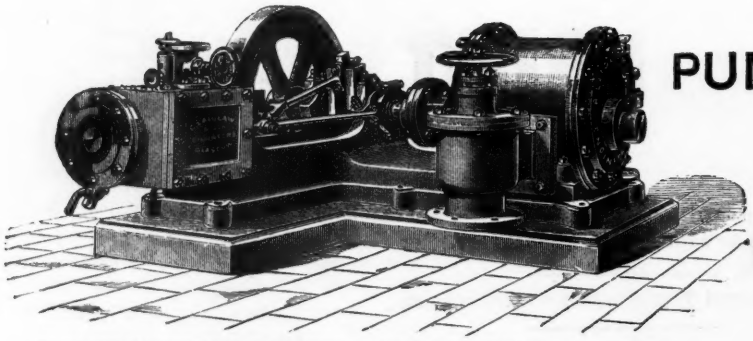

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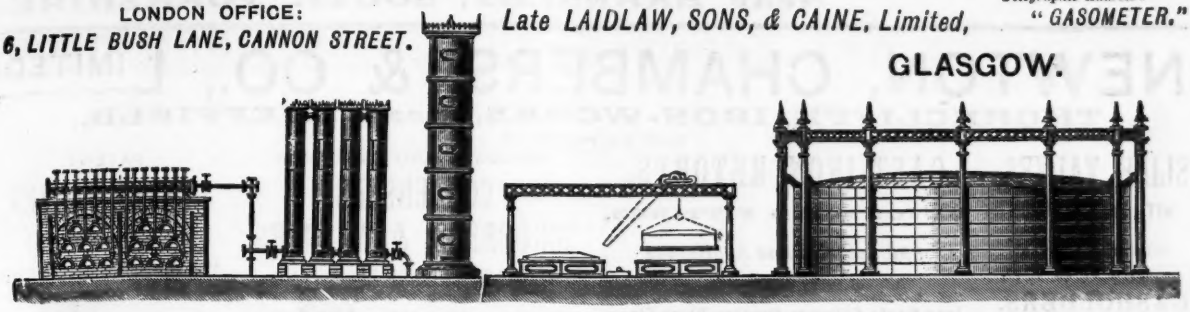

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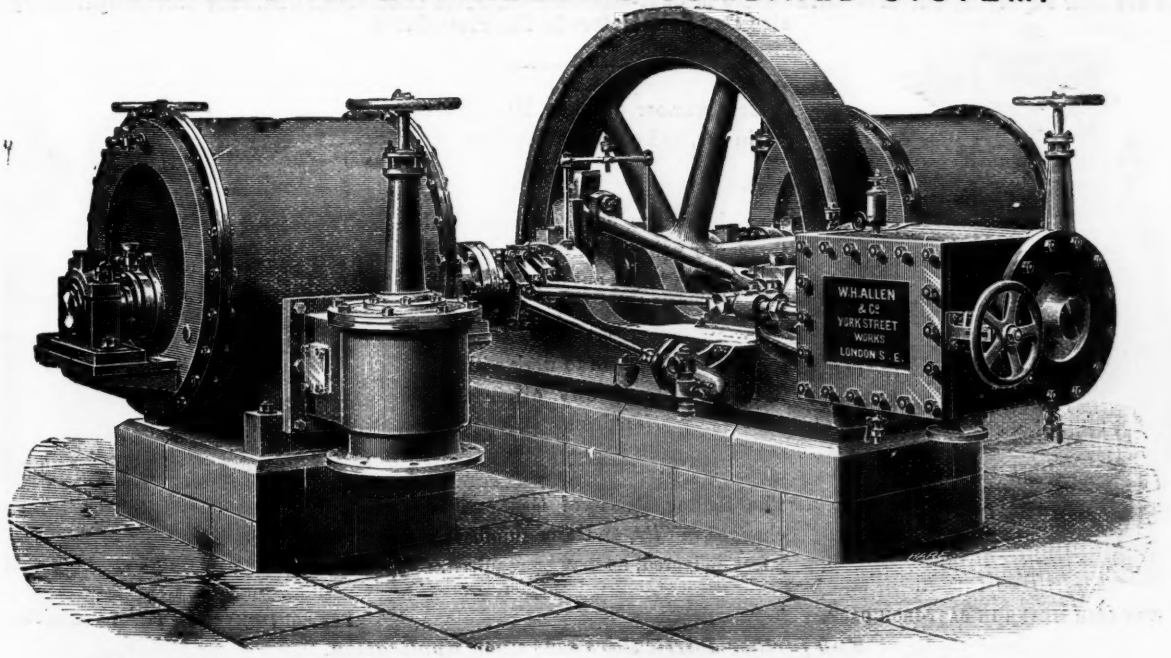

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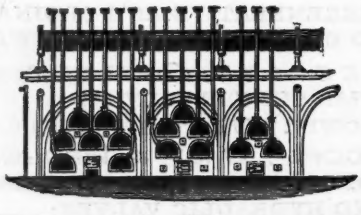

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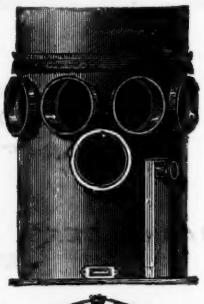

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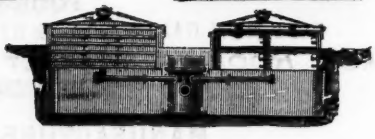

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A large number of these Meters are in use, and giving satisfaction.

The Mechanism is very simple; and there are no springs or complicated parts to get out of order.

We supply them to work with **1d., 1s., or any other Coin desired.**

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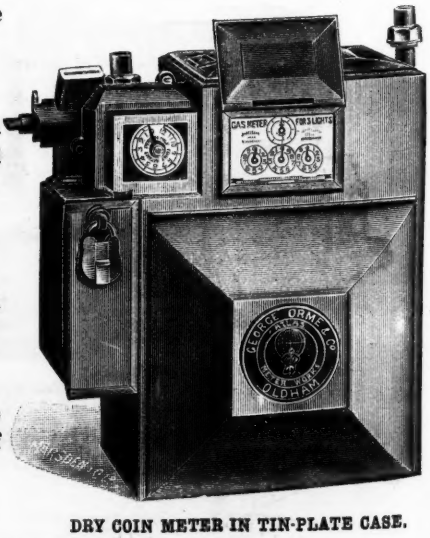

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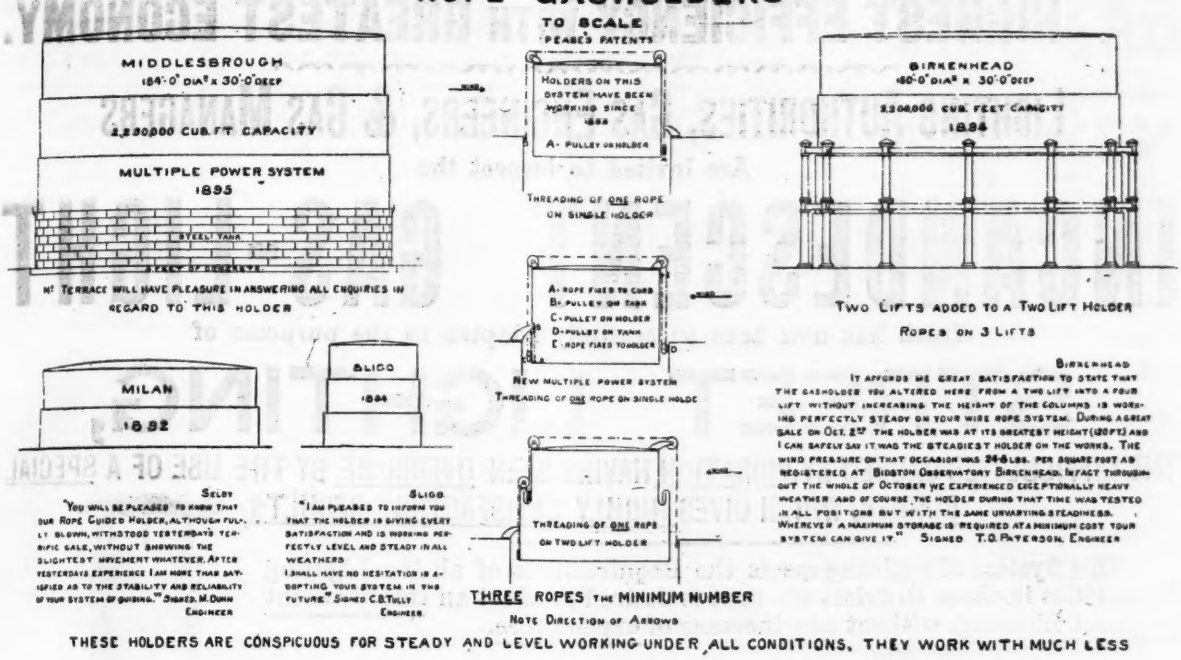
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2,230,000 CUB. FT CAPACITY
MULTIPLE POWER SYSTEM
1895
STEEL TANK
BRICK OR CONCRETE
Mr TERRACE WILL HAVE PLEASURE IN ANSWERING ALL ENQUIRIES IN REGARD TO THIS HOLDER
HOLDERS ON THIS SYSTEM HAVE BEEN WORKING SINCE 1888
A- PULLEY ON HOLDER
THREADING OF ONE ROPE ON SINGLE HOLDER
A- ROPE FIXED TO CURB
B- PULLEY ON TANK
C- PULLEY ON HOLDER
D- PULLEY ON TANK
E- ROPE FIXED TO HOLDER
NEW MULTIPLE POWER SYSTEM
THREADING OF ONE ROPE ON SINGLE HOLDE
BIRKENHEAD
180'-0" DIA.R x 30'-0" DEEP
2,208,000 CUB. FEET CAPACITY
1894
TWO LIFTS ADDED TO A TWO LIFT HOLDER
ROPES ON 3 LIFTS
MILAN
1892
SLIGO
1884
THREADING OF ONE ROPE ON TWO LIFT HOLDER
THREE ROPES THE MINIMUM NUMBER
NOTE DIRECTION OF ARROWS

SELBY

"You will be pleased to know that our Rope Guided Holder, although fully blown, withstood yesterdays terrific gale, without showing the slightest movement whatever. After yesterdays experience I am more than satisfied as to the stability and reliability of your system of guiding." Signed, M. Dunn Engineer

SLIGO

"I am pleased to inform you that the holder is giving every satisfaction and is working perfectly level and steady in all weathers. I shall have no hesitation in adopting your system in the future." Signed C.B. Tully Engineer

BIRKENHEAD

It affords me great satisfaction to state that the gasholder you altered here from a two lift into a four lift without increasing the height of the columns is working perfectly steady on your wire rope system. During a great gale on Oct. 2nd the holder was at its greatest height (120 ft) and I can safely say it was the steadiest holder on the works. The wind pressure on that occasion was 24·8 lbs. per square foot as registered at Bidston Observatory Birkenhead. In fact throughout the whole of October we experienced exceptionally heavy weather and of course the holder during that time was tested in all positions but with the same unvarying steadiness. Wherever a maximum storage is required at a minimum cost your system can give it" Signed T.O. Paterson, Engineer

THESE HOLDERS ARE CONSPICUOUS FOR STEADY AND LEVEL WORKING UNDER ALL CONDITIONS, THEY WORK WITH MUCH LESS FRICTION AND IRREGULARITY IN A GALE OF WIND THAN GASHOLDERS WITH COLUMNS, AND ARE ALWAYS STEADY

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LATEST

Improvements in Sulphate of Ammonia Apparatus

(COLSON'S PATENT)

EXTRACT FROM ENGINEER'S REPORT—

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HIGHEST EFFICIENCY WITH GREATEST ECONOMY.

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Are invited to inspect the

INCANDESCENT GAS-LIGHT

Which has now been successfully adapted to the purposes of

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THE DIFFICULTIES CAUSED BY VIBRATION HAVING BEEN OVERCOME BY THE USE OF A SPECIAL BURNER, WHICH GIVES HIGHLY SATISFACTORY RESULTS.

This System of Lighting meets the Requirements of all the Lighting Authorities in those Districts where it is desired to effect an Improvement in Street Lighting, without any increase of expenditure.

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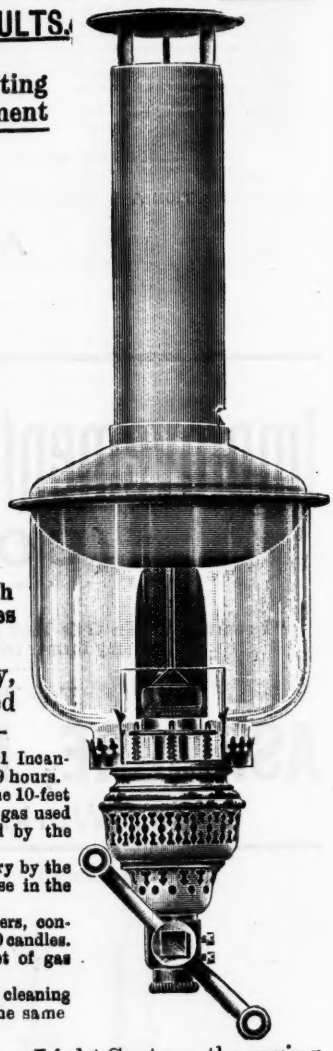

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The Lighting Engineer of the Kensington Vestry, in a report dated the 14th of May, 1895, addressed the Works and Sanitary Committee as follows:—

(1) During the months of January, February, and March, 1895, 31 Incandescent Gas-Lamps were in use for an average period of 1167·89 hours. The estimated quantity of gas that would have been consumed by the 10-feet flat-flame burner was 11,678 cubic feet. The actual quantity of gas used by the Incandescent Gas-Light Company's Burners, as recorded by the meters, was 4415 cubic feet.

After allowing for the extra cost of up-keep, the gain to the Vestry by the use of these burners was £20 3s. 4½d., and a large increase in the Illumination of the Street.

(2) The illuminating power given by the Incandescent Gas-Burners, consuming 3·78 cubic feet of gas per hour, was found to be equal to 60 candles. That given by the flat-flame burners, consuming 10 cubic feet of gas per hour, was 26 candles.

The lanterns fitted with Incandescent Burners only require cleaning 9 times in 90 days, as compared with 26 times' cleaning in the same period required by the lanterns filled with flat-flame burners.

The net result therefore appears to be that, by the use of the Incandescent Gas-Light System, the saving effected is 15s. per lamp for this quarter, after paying for the up-keep of the Burner, and at the same time more than double the light is obtained. It must be noted, however, that these results were obtained with the ordinary burners, and not with the improved burners with the anti-vibration springs. With the latter, the expense of up-keep would be materially reduced, and the saving consequently increased.

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WEST'S GAS IMPROVEMENT COMPANY, LTD.,

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AND

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MACHINERY

FOR

CHARGING

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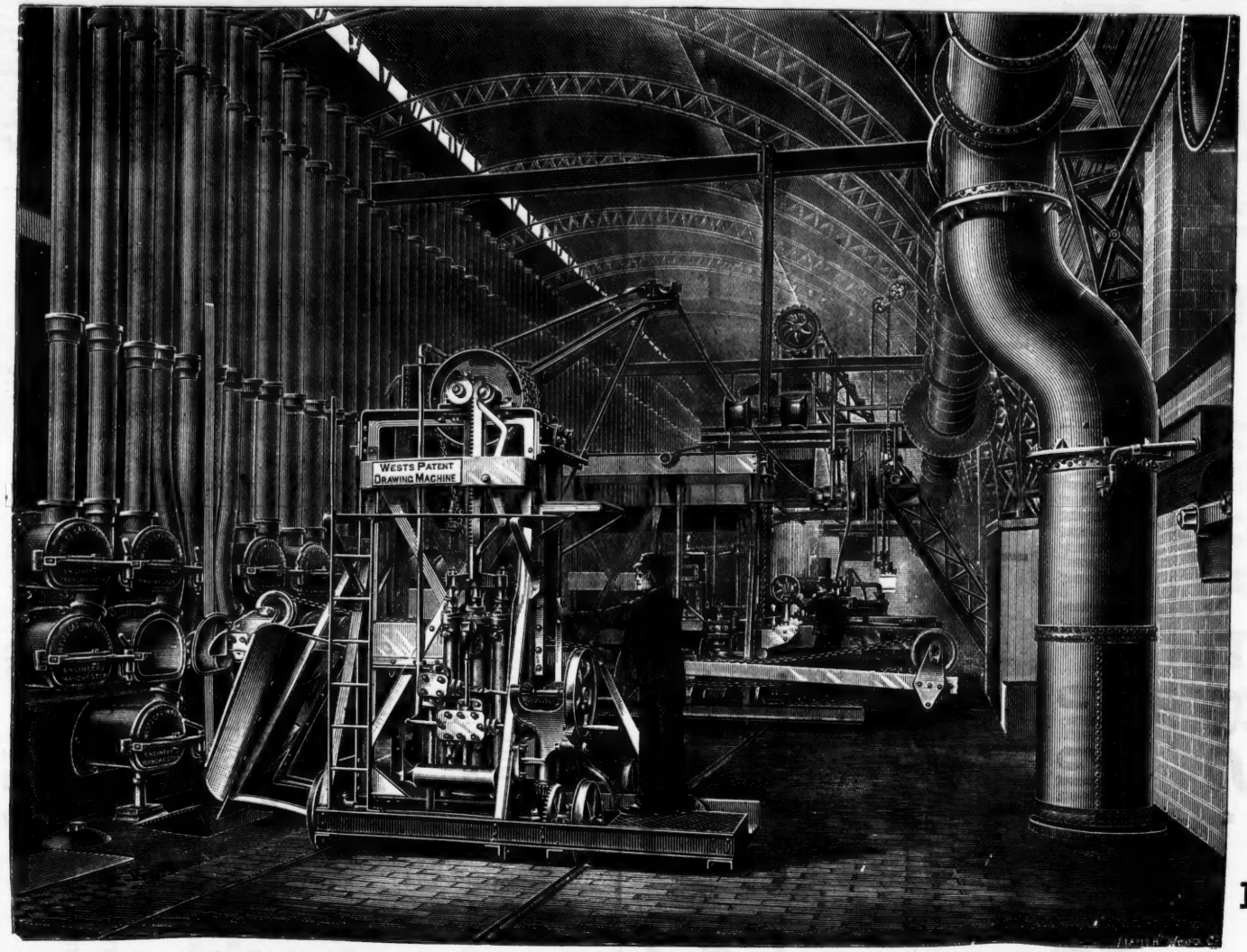
DRAWING

GAS-

RETORTS.



Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

AND

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OVER

560,000

LINEAL

FEET

OF

RETORTS

DAILY

ARE CHARGED

AND DRAWN BY

WEST'S

MACHINES.

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Prices, &c., on application to the above.

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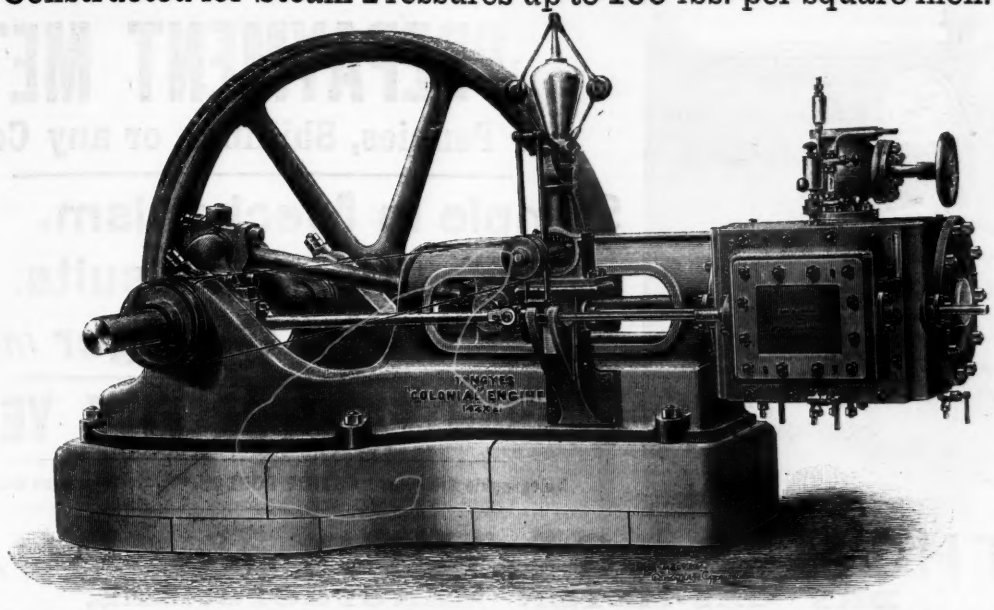
TANGYES'
"COLONIAL" STEAM-ENGINE

Constructed for Steam Pressures up to 100 lbs. per square inch.



Tangyes' "Colonial" Steam-Engine, with the TANGYE-JOHNSON PATENT AUTOMATIC CUT-OFF GEAR. From a Photograph of the 14½ in. by 21 in. size.

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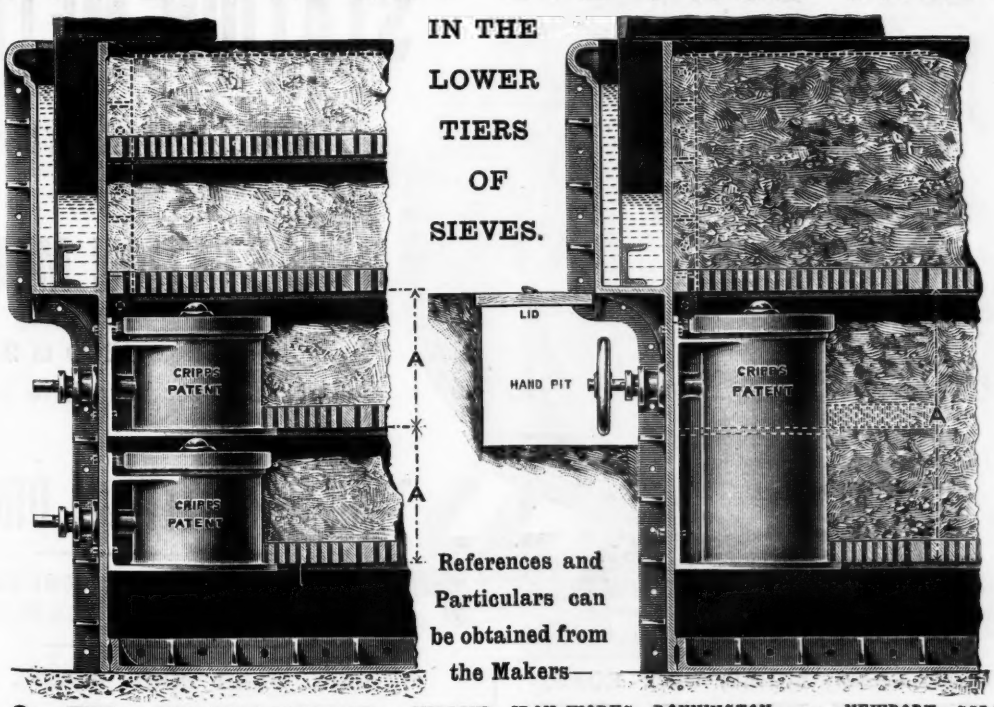
Practical Experience proves their Economy.



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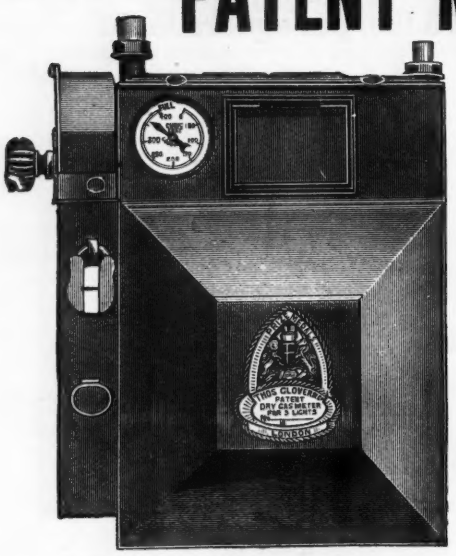

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Simple in Mechanism.
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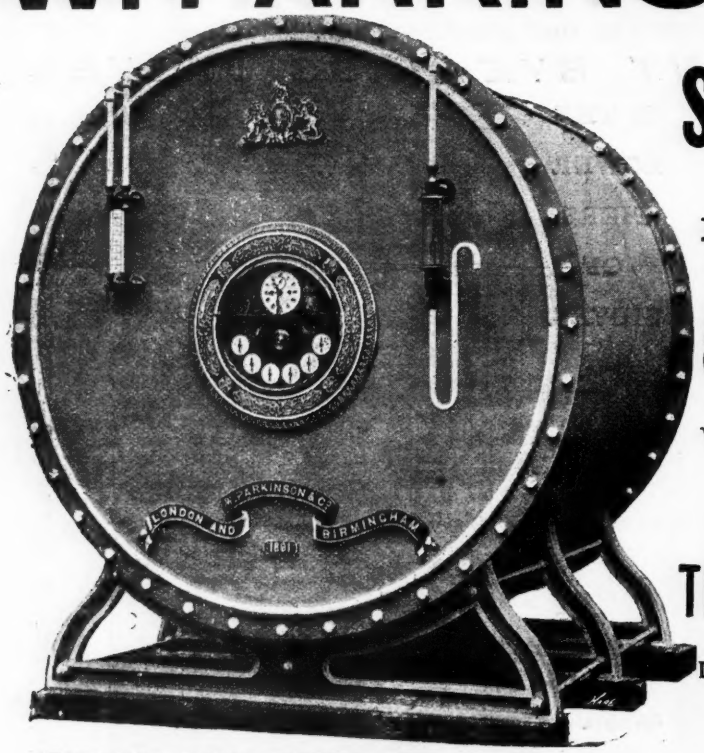

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EDITORIAL NOTES.

The Commercial Company's Report and Accounts.

In another column will be found the Directors' report and the statement of accounts relating to the last half-year's operations of the Commercial Gas Company, whose ordinary general meeting is to be held on Thursday. It is greatly to be wished that the Board of this Company would seriously consider whether some means could not be devised for the issue of these official publications, and holding the meeting, at the same time as their neighbours. The Company's Act of Parliament is supposed to require the ordinary general meetings of the proprietors to be called in April and October; but nobody would be more affected by an alteration of the month than was experienced when the first meeting in 1893 was held on a Thursday instead of, as had previously been the rule, on a Friday. It would be much more convenient for the purpose of comparison of the three Companies' working, which is really one of the principal reasons for their continued separate existence, if all the figures were made available about the same period. We are confident that the Commercial authorities have no wish to shrink from any such comparison; and we venture to put it to the Board that perhaps the statutory requirements might now be met by the holding of a *pro formâ* meeting to confirm issues and declarations actually made a couple of months earlier.

With regard to the present report, which is in the almost stereotyped phraseology affected by the Board, it is stated that the revenue account shows a net profit for the half year of £43,006; making, with £598 received for interest, £43,604. The addition of the amount carried forward brings this up to £65,509. Deducting therefrom the debenture interest of £3712, the balance available for division stands in the net revenue account at £61,796. Out of this, it is recommended that dividends at the rates of 13½ and 10½ per cent. per annum should be declared on the old and new stock respectively, and that the difference between the declared rates and the authorized dividends of 13¾ and 10¾ per cent. should be carried to the reserve fund. At the corresponding period of last year, the net profit was shown to be £49,466; and the balance available for dividend was £71,093. The price of gas was then, however, 2s. 7d. per 1000 cubic feet, whereas now it is 2s. 6d. The capital account shows that very considerable extension is going on in the distribution of gas in the district; the sum of £7088 having been spent, mostly on new mains, stoves, and meters both of the ordinary and the coin types. The accuracy of the adjustment of the selling price to the conditions of the business is shown by the fact that, notwithstanding the penny reduction, the gas-rental received amounted to £132,350, which closely approximates to the £133,536 of the corresponding period of 1894. Ordinary meter-rental is steadily on the increase; and coin-meter rental has doubled in amount for the half year. Residuals, of course, are down; coke being £2148 to the bad, and sulphate having dropped by nearly one-half, or from £8773 to £4809. A diminution in the return for residuals by more than £6000 is a serious check upon the progress of the Company towards further reductions in the price of gas. On the other side of the revenue account, it appears that the total working expenses were the same within a trifle, as for the latter half of 1894. Coals and wages are more; but a considerable decrease appears in the entry for works maintenance. The charge for superannuations altogether drops out of this account. The quantity of gas sold shows an increase of 2·1 per cent., which, considering the character of the district, and what has been stated of late as to the condition of some of the chief local industries, must be regarded as satisfactory. Altogether, these accounts are highly creditable to the administration and the management; and before leaving the subject, notice should be taken of a realized economy of about 2000 tons of coke and 2500 tons of breeze used for fuel during the half year, notwithstanding an increased coal carbonization of 4422 tons. This looks as if Mr. H. E. Jones had at last found a pattern of improved furnace worthy of his adoption.

The Incandescent Gas-Burner Litigation.

The incandescent gas-burner litigation was continued last week and yesterday, and is still going on. Only three days last week were, however, available for the hearing. On the Monday, as already mentioned in last Tuesday's

JOURNAL, the De Mare case was finished; judgment being reserved until after the completion of the hearing of the Sunlight case, which immediately followed it. The same leading Counsel and expert witnesses are engaged in both actions; the issues raised and the consequences involved being also very much the same, with a difference. The alleged infringement of the Sunlight Company is a mantle to all intents and purposes like the Welsbach article, only stated to be prepared from zirconia, alumina, and chromium oxide. These are cheaper materials than the rare earths originally selected for the same purpose by Herr Auer von Welsbach, and specified in his 1885 patent. But the plaintiffs claim that their 1885 patent is infringed thereby, inasmuch as the Sunlight mantle can only be made by following the instructions first published in this specification. And as for the use of alumina and chromium oxide in the impregnating fluid, the plaintiffs claimed that this was previously patented in 1891 by Haitinger, whose patent was confessedly for the improvement, in the way of cheapening, of the Welsbach mantle, and is in their possession. Against Haitinger the defendants set up Dellwik, who took out a patent in the previous year for a process which the plaintiffs contend was merely for the improvement, by a second dipping, of previously-formed incandescent bodies. They suggest in explanation that Dellwik had in his mind such incandescents as the Fahnehjelm comb or the Clamond basket, rather than the Welsbach mantle. Much contention raged both on Monday and on Friday, upon the old point of why some zirconia gave good mantles and another brand of the same substance failed to do so; and the influence of ammonia upon the strength of mantles in preparation was again brought in question. On Saturday, after some further evidence upon the chemical points had been gone into, the plaintiffs declared their intention of dropping the Haitinger claim, with a view to shortening the proceedings, which threatened to stretch out to some end far beyond mortal ken. This naturally entailed the suppression of the counter-case of Dellwik. The further proceedings consequently fell back upon the original Welsbach 1885 patent; and the Court rose early on Saturday with something like an expression of relief at the prospect of these dreary chemical controversies coming to a speedy close. Yesterday Dr. Hehner was recalled to inform the Court how he had again failed to make mantles by using yet another sample of zirconia which it appeared the plaintiffs had not had an opportunity of examining; and the rest of the day was occupied with the taking of evidence of witnesses upon formal points, and the reading of the testimony of Professor William Crookes, taken on commission. It appeared likely towards the end of these proceedings that the whole business would be over to-day; but it is, of course, quite possible that it may extend into to-morrow. Next week, at any rate, we hope to be able to complete our report, including the judgment, which from what has fallen from the lips of the learned Judge, is almost certain to be given immediately.

Coin Meters and Machines in Court.

THE working of coin-controlled meters and other machines of the same order has been brought under public notice of late in several ways. Robbery, with violence, appears to be undesirably prevalent in some districts in respect to these defenceless friends of the poor; and it is by no means clear how this mischief can be prevented. There are places in every considerable centre of population where a man's life would not be safe if he were known to have a shilling about him, and to be incapable of defending himself or of raising an alarm. Hence it cannot be wondered at that the sight of a gas-meter, which is known to be also a cash-box, at their mercy, should sometimes prove an irresistible temptation to the dishonest and the destitute. The possibility of discrepancy between the action of the coin attachment and the registration of the meter, which is one of the incidental troubles of putting in use untried instruments of the kind, was illustrated in a Police Court case reported elsewhere, when The Gaslight and Coke Company had to sue two householders for £1 4s. and 8s. 10d. respectively, being the amount of difference existing between the prepayment and that due for gas consumed. Of course, the Company succeeded, probably on account of their written agreements providing for such incidents. But it should be widely known that the prepayment attachment is adopted solely for the convenience of consumers, and does not dethrone the authority of the index, which still remains by law the *primâ facie* evidence as to the quantity of gas consumed. A curious point of law arising out of the practice of tampering with the automatic sweetstuff-supplying machines to which the public have access was disclosed in an Edinburgh Police Court. A boy had been caught at the by no means original trick of persuading a machine to yield him a piece of chocolate upon the inducement of a disc of base metal inserted in the slot appointed for the reception of coin; but upon being charged before the Magistrate with stealing the chocolate, the Court refused to convict the offender of a larceny, upon the philosophic ground that where there is no possibility of reciprocity there can be no crime. If, said the Magistrate, the machine in question had had a piece of lawful money administered to it, and failed to respond in the manner to be expected of it, could the owner be indicted for robbery of that coin? Obviously not. Wherefore the person who cheats the machinery is not amenable to the criminal law. We have the impression that this very question was brought, in the early days of automatic trading, before the special Court for the Consideration of Crown Cases Reserved, consisting of the Lord Chief Justice and fourteen other Judges. The gist of the decision then arrived at has escaped our memory; but we retain a hazy notion that its tenor was contrary to the opinion of the Edinburgh Magistrate, on the ground that the machine is an agent of the owner.

Gas and Water Joint Boards.

IN the course of the important debate in the House of Commons on the Water Bills of the London County Council, Mr. Chamberlain made some noteworthy remarks upon the experience of the Birmingham Corporation in regard to their acquisition of the local gas undertakings. The County Council proposed to take over the property and obligations of the London Water Companies, regardless of the fact that the area of supply covered by these undertakings is very much larger than the Administrative County of London, which is their own province. The headstrong Progressive party in the Council, who are responsible for this water purchase scheme, refused to see in this circumstance any bar to the accomplishment of their design. But Mr. Chamberlain was able to tell the House something bearing very strongly upon this point. He admitted that the Corporation of Birmingham were ill advised in setting themselves up as the sole gas-supplying authority over a region comprising a number of independent local government districts. They were only enabled to do so on condition that the authorities in the districts should have power to appropriate such portions of the gas undertaking as lay within their own boundaries; and it is history how quickly and completely this power was exercised. One of the results of this disruption of the original undertakings was to neutralize in a great measure the object sought to be attained by the transfer. Instead of gas being manufactured at one or two large centres, there was actually a multiplication of gas-works within the old area. Mr. Chamberlain has lived to see and acknowledge that it would have been far better if, instead of the Corporation of Birmingham taking over the gas undertakings, this had been done by a properly-constituted Gas Board, representing all the local interests involved. He might have gone farther, and shown that this is actually the policy now found to be most effective in dealing with gas and water undertakings spread over several adjoining but independent local government districts. Where such undertakings have been placed under the control of one, albeit the largest, local authority interested, friction has generally arisen in the administration. This has usually resulted from two causes. In the first place, it has arisen from the tendency of the supplying authority to make a profit out of their neighbours; and, secondly, in some instances it has also been due to the desire of the minor, or outlying, authorities to go into the business on their own account. Both causes operated in the case of Birmingham; and Salford supplies an example of the operation of one of them without the other. In the interest of the gas industry, we confess to a preference for the administration of large gas undertakings by a Joint Board, if the Company must be expropriated; for the reason that such composite authorities are usually compelled to sell gas at cost price, which prevents all risk of their falling out over the division of profits. Besides, many of the difficulties of

gas-works administration by a Municipality do not occur with a composite Board, which is much less numerous, to begin with, than any Municipality, and is less open to the worst of the influences that sometimes injuriously affect the working of Corporation Gas Committees.

Parliamentary Committees and Permanent Tribunals.

Upon the occasion of the meeting in London last week of the Association of Chambers of Commerce, Mr. Pim, of the Dublin Chamber, introduced the subject of Private Bill Legislation, and moved that, in the opinion of the Association, the time had come to carry into effect reform by substituting for the costly, inconvenient, and uncertain system of Parliamentary Committees, sitting only during the session of Parliament, of a permanent tribunal, carrying on its business during the entire year, and holding inquiries in the localities concerned in the projects coming before them. This motion was seconded by a gentleman from Newcastle-upon-Tyne, supported by others, and carried unanimously. Shortly afterwards, a motion strongly condemnatory of "commercial gambling" was brought forward, only to be withdrawn after a "controversial discussion." Hereupon one is led to wonder whether the members of the Association are quite as competent to pass an opinion upon the matter in regard to which they so comfortably agreed, as they probably are with respect to the question that so hopelessly divided them. One has heard a good many times of this suggestion for the substitution of a permanent tribunal for the Parliamentary Committee system; but the question never gets any nearer a practical solution. It is not necessary to believe in the infallibility of Parliamentary Committees to hold that a very strong case indeed would have to be made out for a change of system in favour of what is called a permanent tribunal, before Parliament and the public would agree to it. People talk about the costliness, inconvenience, and uncertainty of the Parliamentary Committee system, as if these qualities belonged to this system alone. What about the "glorious "uncertainty of the law," which is a proverb, to say nothing about the "law's delay," and the costliness of legal procedure that is often declared to amount to denial of justice? And where is the inconvenience of having to come to London during the season on Private Bill business? Who is really aggrieved thereby? On the other hand, it is too often overlooked that in Parliament those who disagree respecting the expediency of schemes of legislation have a tribunal from which there is no appeal, and which is certain to do their business within a comparatively brief period after having been set in motion. How many litigants wish they could go (say) from a Court of First Instance straight to the House of Lords, and have their cases ended one way or another without dragging through the usual tedious course! The chief argument against the suggestion of the Association of Chambers of Commerce, however, is that the questions with which Parliamentary Committees are usually occupied are those of expediency, not of law. Although they are legislative bodies, they do not profess to know anything about the law, and flatly decline to meddle with it. When it comes to be a question of whether it is expedient that a man's land should be compulsorily taken from him in the public interest, it is probable that a Parliamentary Committee is more likely to arrive at a just conclusion on the matter than any two or three Judges of the High Court of Justice who might be put in their place. Moreover, it is often forgotten, by people who talk in the manner of Mr. Pim, of Dublin, that where there is no great interest involved, projects of legislation of many kinds can be already discussed, and their terms settled locally, by the Provisional Order system. It would be impossible to devise a simpler or cheaper procedure than this. There are matters, however, as a good many prominent Dublin citizens know full well, that Parliament alone is competent to deal with. There is pending at the present moment a proposal emanating from the Dublin Corporation which aims at subverting the settlement of the local gas question, made by Parliament only a few years ago. What other or lesser tribunal would be regarded as competent to pronounce upon such a project? If the Association of Chambers of Commerce wanted to know what Parliamentary Committees are good for, the lesson might have been given to the members by Mr. Pim, if he would have been willing to discuss his motion with special reference to the Bill which has been promoted by the Corporation of Dublin.

WATER AND SANITARY AFFAIRS.

The House of Commons on Tuesday last, after a debate occupying nearly three hours, negatived the second reading of the Chelsea Water (Transfer) Bill by a majority of 287 against 125. The five other Transfer Bills which awaited their second reading, necessarily shared the same fate. The motion for the reference to a Select Committee of the Transfer Bills relative to the Lambeth and the Southwark and Vauxhall water-works was withdrawn, and the order discharged. The motion for the second reading of the Kent Water Board Bill was negatived without a division. The East London Water (Height of Supply) Bill was postponed. The Staines Reservoirs Bill, the New River Company Bill, and the Bill of the Southwark and Vauxhall Company, were read a second time, and referred to a Select Committee of nine members to be appointed, subject to an Instruction moved by Mr. Chaplin. The Water Bills of the Chelsea and Lambeth Companies, suspended from the previous session, were referred to the same Committee as the foregoing. Into this catalogue of Bills we are constrained to enter, as showing the clean sweep made by the House of Commons at a single sitting. Nine Bills were thus completely demolished. A tenth is tolerably certain to follow. The five promoted by the Water Companies are going before a Hybrid Committee; and in due course the Metropolitan Counties Water Board Bill will doubtless come down from the House of Lords. Thus Parliament has had before it as many as sixteen Bills relative to the water supply of the Metropolis and its suburbs. The number now is reduced to seven, or perhaps we may say six. Nor has this result been arrived at by a slender majority. The vote of last Tuesday stands in striking contrast to the bare majority of one, by which the question of the London Water Supply was rescued from a perilous crisis in 1894, though even that came too late to prevent some serious consequences in 1895. This overthrow of the Transfer Bills has come to pass despite negotiations between Mr. Stuart and Mr. Chaplin, as to which the Parliamentary Committee of the County Council on Thursday passed a resolution (carried by the fateful majority of one), expressing regret that they were not informed of what was going on. The Committee feel aggrieved that an opportunity was not afforded them "of expressing an opinion as to the "course to be adopted in the altered circumstances." What were "the altered circumstances?" Apparently the introduction of the Government measure in the House of Lords, and the reception of Mr. Stuart to a conference with the President of the Local Government Board. Here was an opportunity to agree with the adversary, and it had to be done quickly; but the chance was lost. The Council share the fate of those whom the gods would destroy. They lack the proper exercise of reason. They committed their case into the hands of Mr. Stuart; and Mr. Chaplin found that this gentleman was impracticable upon the one point that was essential to an arrangement by which the Transfer Bills might possibly have been allowed to run on concurrently with the Government measure. Mr. Stuart stuck to the arbitration clause embodied in the Council's Bills; while Mr. Chaplin desired the Council to rely upon the ordinary law. To this proposal, Mr. Stuart, as representing the Council, was "either unwilling or unable to consent;" and the negotiations "perforce came to an end."

It was the last hope for the Transfer Bills that they might serve as a kind of supplement to the Government scheme. For this, Mr. Stuart pleaded when moving the second reading. But he had previously rendered this association impossible. Nothing could be more vital than the terms of purchase; and those proposed by the Council were such that the Government could not entertain them. Had they done so, it would have sealed the fate of the Water Trust; and Mr. Chaplin was not disposed to sink in the same ship with the County Council. Mr. Stuart was left to "paddle his own canoe;" and he heroically went over the falls. The organs which represent or support the County Council are utterly amazed. Have not the Council, in promoting Bills to municipalize the water supply, acted in harmony with the recommendations of nearly every Committee and Commission which has considered the question? Did not a Conservative Parliament in 1890 empower the Council to spend money

in investigating the water question, and to initiate negotiations with the Water Companies? Did not the present Home Secretary preside over a Committee which recommended the County Council as the proper authority to deal with the water question? Yet, after all, we are told "it was this consistent policy of "different Parliaments and various Committees" which was upset on Tuesday last. There is worse yet to be deplored, for "not only were the Council's Bills killed, but "the Council was told that it had no business to interfere "in this water question at all, and that, so far, it had done "nothing right." It is now asked: "What next?" and by way of answer it is said: "The only hope of progress is to "kill the Government Bill, which blocks the way in any "rational reform." The hope is a desperate one, looking at the majority which threw out the Transfer Bills last week. But we have no doubt the effort to "kill" will be made, with all the force the party can command.

As for the "consistent policy of different Parliaments "and various Committees," Mr. Chaplin, in declaring the policy of the Government on the water question, showed how admirably the Water Board Bill agrees with the principles laid down in the report of the Committee presided over by Sir William Harcourt in 1880. It was recommended in this report that "a Water Authority of "a representative character should be constituted," and that a Bill having that object should be "introduced at "an early date by Her Majesty's Government." Mr. Chaplin was able to say to the House: "The Government "have introduced such a Bill." Sir William Harcourt endeavoured to correct Mr. Chaplin in quoting from the report, because he omitted the words: "In the absence of "any municipal body to which these functions should be "committed." Mr. Chaplin's rejoinder was well to the point: "There is no municipal body, so far as I am aware, "that represents the district." The jurisdiction of the London County Council falls short of what is required for dealing with the parliamentary areas of the Metropolitan Water Companies; and this is a fact which even the Council themselves have been compelled to recognize. The clearer apprehension of this disparity as time has passed on accounts, in some measure, for the present setting aside of the Council. But the policy of the Council has further served to create antagonism and distrust. The speech made in the House by Mr. Chamberlain shows how a statesman, well disposed towards the Council, is yet compelled to utter censures on that body as obstructing a proper settlement of the water question. If it were possible, Mr. Chamberlain would yet make peace with the Council in regard to this matter. But he intimates that the case is hopeless if they say: "We will not have a "settlement unless you enable us to extort terms which "have never been asked for in any previous case by a "municipal authority." The question is clearly one to be settled without the intervention of the Council; and to this point the whole affair is now tending. A report which comes before the Council to-day from the Joint Parliamentary and Water Committee regrets "the destruction of "the Council's Bills, and the indefinite postponement of "purchase"—that is to say, "purchase" on the Council's terms.

Steam-Engine Economy.—In the course of a paper read by Captain H. Riall Sankey, R.E., M.Inst.C.E., at the Institution of Civil Engineers last Tuesday, on "The Thermal Efficiency of Steam-Engines," he pointed out that the actual commercial criterion of a steam-engine's economical performances—viz., the number of pounds of water per indicated horse power—led to errors of about 1 per cent. as a maximum, when using saturated steam; but that the error might be as much as 13 per cent. when superheated steam was used. This difficulty would be met by stating the amount of heat required per indicated horse power, as proposed by Mr. Mair-Rumley in 1882.

Mr. T. L. Willson's English Patents.—At the end of the notices of intended applications to Parliament which appeared in the "JOURNAL" for Dec. 3 last, it was mentioned, as a matter of interest to the gas industry, that a Bill was to be promoted to authorize the Comptroller of Patents to antedate two patents, of Aug. 27 and Sept. 1, 1894, respectively, granted to Mr. T. L. Willson and Mr. G. B. Ellis for the production of metallic carbides, to Feb. 28, 1894, the date of the American application. The reason for seeking the alteration of the dates was obvious in view of what had been published by certain French chemists. The Bill came before a Committee of the House of Lords on Monday last week; when its opponents (among whom were Messrs. Read Holliday and Sons, Limited, of Huddersfield) were successful in getting it rejected.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 714.)

THE course of events on the Stock Exchange last week was destitute of interest; and, apart from the increasing tendency to fall away in point of volume as the holiday period approaches, business in general was rather under a cloud. The week opened under the influence of some little apprehension with regard to political affairs, and continued rather sensitive throughout; and the news from the Transvaal on Thursday was the reverse of reassuring. The brighter spots to be noted were the steadiness of the gilt-edged division, and the strength of home rails; but elsewhere the course of prices was downward. The settlement was very light, and devoid of difficulties; and it did not produce much demand upon the resources of the Money Market. Business in the Gas Market was really quite active and interesting; the chief feature being the recovery in the two big issues which were recently put down so freely. Gaslight "A" opened weak, and had a further fall; and on Tuesday, it touched 287—the lowest figure marked since the dividend was raised to 12¾ per cent. Then, after a little wavering, it began to recover, and so rapidly that business on Saturday was marked at 299. A fair amount of business was done in the secured issues also; and prices were good, though they did not improve. Transactions in South Metropolitans were exceedingly slack; but the few transactions marked showed good prices—the "A" in particular commanding top figures. Nothing at all was done in Commercials, except one "special" bargain in the old stock, which was unimportant. The Suburban and Provincial Companies were, if possible, a little quieter than ever, so great is the scarcity of stock; and there is no change apparent in the quotations beyond a good advance in Brightons *ex div.* The Continental group presented another instance of recovery in Imperial Continental, which, after being flat for some time past, had an agreeable reaction. European fully paid, which had been pushed too far in front of the other issue, receded half a point. Union was firm. Among the other undertakings, Cape Town moved up on the announcement of a higher dividend for last half year. Business in Water was about the same in point of volume as the week before. Quotations were mostly, though not uniformly, higher. Several debenture stocks advanced.

The daily operations were: The Gas Market was pretty active on Monday; but business was almost entirely confined to Gaslight issues. The "A" fell 2; but San Paulo rose ½. Transactions on Tuesday also were mainly in Gaslight "A," which dropped to the lowest point of the week. Imperial Continental improved 1; but European fell ½. East London Water receded 3. Business sank to small proportions on Wednesday. Brighton ordinary rose 3. In Water, West Middlesex was 2 better. Thursday was marked by a recovery of two points in Gaslight "A," with business done at 294. Cape Town advanced 1. The tendency on Friday continued very favourable, though business was limited. Gaslight "A" rose 5; and Imperial Continental, 1½. Saturday's prices in Gas were good, though quotations did not move. In Water, Chelsea and West Middlesex gained 3; and East London and Lambeth, 1.

ELECTRIC LIGHTING MEMORANDA.

High-Voltage Fire at Hamburg—Competition in Electricity Supply—A Lesson from Gas—The Right and Wrong of Competition.

IN connection with the proposal to increase the voltage of direct-current supply systems, considerable discussion has taken place with reference to the safety limit of the voltage that consumers' fittings can be expected to carry. Some light is thrown upon this important question by an accident reported from Hamburg, where the tramway current at 520 volts pressure was switched on to the electric light mains. The result was that several fires broke out in consequence of the short circuits produced in the fittings and in casings. Where fittings were adapted for gas and electric light, the current burnt through the gas-pipes and set the gas on fire. This must have been a disturbing experience for the consumers; and one would like to know how such a wrong connection could have been possible. At any rate, the incident may be interpreted as a warning against the general adoption of the system—recommended for some English municipal installations—of combining the working of a tramway and an electric light plant. The prospect of securing a saving in station expenses by this means, cannot suffice to outweigh that of the disfavour with which the public would regard any system of electricity supply capable of such vagaries as that at Hamburg. But in connection with this particular accident, one is inclined to ask, "Where were the police?" For it is understood that the paternal German municipal administration is exceedingly solicitous for the public safety, and insists upon interfering, to an extent which Englishmen would esteem intolerable, with every commercial and industrial enterprise, with a view to seeing that everything in and about it is quite safe. Here again it would appear that rampant officialism has let slip the substance of public security, while probably tying up

the subject of its operations with all sorts of petty rules and regulations imagined to effect this object.

The question whether competition in electric supply should continue to be sanctioned by Parliament was raised in the recent proceedings in Committee on the Provisional Order of the Charing Cross and Strand Electricity Supply Corporation. As the law stands at present, the grant to any undertakers of statutory authority to supply electricity within any area does not in any way hinder or restrict the grant of concurrent powers to the same effect within the same area. This is expressly laid down in the Electric Lighting Amendment Act of 1888; and the provision is not by any means a dead letter. It had its origin in the Electric Lighting Act of 1882, at which period it was commonly held that, the electric lighting industry being in its infancy, injustice to the public might be done if a single statutory supply upon some system that might become obsolete were imposed upon a district for the full term of the Provisional Order. A good deal has happened in the electric lighting industry since this period; and, among other things, the Metropolitan Electric Supply Company have been successfully engaged in carrying on their business in a large district, part of which, consisting of the area of the Strand District Board of Works, has been practically their own preserve. Into this choice region, the Charing Cross Company desired to penetrate; and the circumstance of the proposed invasion coming so late in the day, prompted the Company in possession to attempt to procure a revision of the condition of the law of electric lighting, which sanctions (if it does not actually encourage) adventure of this kind. Accordingly the Metropolitan Company opposed the Provisional Order of the Charing Cross Company, on the ground that competition in electricity supply is as inexpedient in the public interest as it is admitted to be in respect of gas.

In the endeavour to prove their point, the Metropolitan Company engaged Mr. George Livesey and Mr. Corbet Woodall to instruct the Committee on their experiences in competition of gas companies in London and elsewhere. It is unnecessary, for the instruction of "JOURNAL" readers, to say anything concerning this subject. If the analogy between the electricity supplies and gas had been perfect, doubtless the Committee would have accepted it as convincing; but as a matter of fact, there was the difference between the two cases that, whereas coal gas is coal gas, by whomsoever supplied, electricity is sold under two distinct systems. The Metropolitan Company have the alternating system, and the Charing Cross Company have a direct-current supply; so that there remained between the rivals a difference of precisely the character that the first Electric Lighting Act contemplated as constituting a choice for the consumer. This being undeniable, the Committee did not see their way to altering the statute in favour of the exploiters of one system; and so the Charing Cross Company had their will.

Our contemporary the "Electrician" discusses this matter very fairly, considering that the evils of competition in electric supply have not been brought home to it in the same way that the gas industry of the United Kingdom has learnt the lesson. It rather jeers at the suggestion that competition between two electric light companies must necessarily injure one or the other, and most likely both. But American experience might be cited to prove that the fear of such a result is not groundless. It is all a question, of course, of what character the competition happens to take. If it assumes the "cut-throat" nature, commencing in underselling, then ruin must ensue from it. On the other hand, if what is called competition merely means offering practically the same commodity at the same price, it is difficult to see what good can come of it, although not much harm may be done. It is difficult to believe that, if the Committee had regarded the two systems of supply of the contending companies as being practically the same to the consumers, the grant of competing powers would have been made. There must have been in the mind of the Committee a sense of the existence of such an amount of difference between the two systems as to constitute the possibility of a comparison being made by intending consumers. If there had not been this element in the case, the decision of the Committee must have been different. Even with such a difference as exists between the alternating and continuous current systems, we doubt whether if the one in possession of the field had represented public money—if it had been a local authority's venture—any intrusion would have been permitted. This is another way of saying that injustice has been done in this instance to the Metropolitan Company, because what is not proper treatment for a local authority cannot be right for a company. And this is, indeed, our view—unless it should appear that there is more in the difference between the two supply systems than we have been in the habit of thinking. For it can easily be shown that an electric light district can be most profitably cultivated by one undertaking, and that anything like real competition is impossible in the circumstances of such enterprises. A modified kind of competition may be feasible; but this can only be when the businesses are carried on upon list prices. Parliament heard something about this kind of competition in the course of the debate upon Mr. Quilter's Pure Beer Bill, when it was noticed that the brewers, by common consent, charge the same price for their commodity. It does not appear, however, that the House of Commons was greatly struck by the economy or beauty of this agreement.

THE PHILOSOPHY OF POLITICS AND ADMINISTRATION.

In an article published in last week's "JOURNAL," we repeated our familiar contention respecting the duty that lies upon "practical men" in regard to keeping themselves acquainted with the teachings of the best modern political economists. It is now a duty and pleasure to introduce our readers to a very remarkable book indeed—a book that appears to contain all the latest economic teaching which men of affairs need take account of, and, in addition, presents them with a most marvellous survey of all modern questions relating to government and administration. This is Mr. W. E. H. Lecky's "Democracy and Liberty"—a work which may be best characterized generally as a stupendous literary monument. It would not be easy to say offhand either what this great book does or does not contain for the information and to stimulate the reflections of those men of British race who, having their own work to do in the world, yet feel the need of keeping themselves acquainted with what is going on around them. One's first impression, upon turning over Mr. Lecky's pages, is that here at last we have set out "the whole duty of man" in regard to his public, mundane life; and this is an impression that is deepened by closer acquaintance with these luminous volumes. Henceforward no man can pretend to esteem himself, or be reputed by others, as well informed, unless he has wrestled long with his Lecky, and made some of the author's virtues his own by right of conquest. In what we shall have to communicate here of the contents of the book, there will be no intention to produce any other effect upon readers than a desire to go straight to the work itself. This is not a criticism, but a commendation.

In his preface, the author (now Member of Parliament for the University of Dublin, and previously known as the most philosophic and interesting of living historians), admits that many years ago, when he was deeply immersed in his "History of England during the Eighteenth Century," he was struck by a remark of Mr. W. R. Greg, that "he could not understand the state of mind of a man who, when so many questions of burning and absorbing interest were rising around him, could devote the best years of his life to the study of a vanished past." The best reply that can be made to this very natural criticism of historical study, is that the past does not vanish, but bears fruit in the present—particularly when the past in question is so recent as that with which Mr. Lecky was occupied. The present work, however, is perhaps to be regarded as an outcome of Mr. Greg's saying; and for this provocation, he is deserving of the thanks of Mr. Lecky's readers. It is certain that but for his deep study of the eighteenth century, not even a writer of Mr. Lecky's quality would have been able to see so clearly as he does into the conditions and tendencies of the present.

In the opening sentence of the book, the author—as is right and fitting—strikes its keynote. "The most remarkable political characteristic of the latter part of the nineteenth century has unquestionably been the complete displacement of the centre of power in free governments, and the accompanying changes in the prevailing theories about the principles on which representative government should be based." All the rest of the work is composed of statements of facts exemplifying and illustrating this fundamental political character of the time, and of reasoning upon them and their realized and probable consequences. In the last century, English parliamentary government was inspired by the principle, almost universally held, that the right of voting was not a natural right, but one conferred by legislation on grounds of expediency, or, in other words, for the benefit of the State. "The indissoluble connection between taxation and representation was the very mainspring of English conceptions of freedom;" and since the landowners and other largest taxpayers directly supported the State machine, it was considered to be only right and proper that they should have the direction of it.

Against this principle, Mr. Lecky here puts the contradictory theory of Rousseau, who held that absolute political equality was the essential condition of political freedom. According to this view, every man should have a vote, and a vote of the same value. It rested on the idea of natural and inalienable rights. We all know what followed the first experiment of carrying this system into operation. "It was under this system that the Convention—the most bloody and tyrannical assembly of which history has any record—was elected." Let us pause here for a moment, to ask our author a question. He does not appear to recognize the fact that, under any system of government, the burden of taxation ultimately has to be borne by the lowest, poorest, and most numerous order of the community. Whosoever actually pays the taxes, it is the mass of the people who have to provide the money. If the English parliamentary system of the last century worked fairly well, this could only have been because those who enjoyed power under it exercised their authority with some regard for the people under them. In the France of the same period, the case was notoriously different. It may not be true that the right of voting is, as Rousseau taught, a natural and inalienable right; but if, upon the other principle, it is the bearing of taxation that precedes the right to a vote, does not this very consideration justify the extension of the suffrage to the mass of the population? One always, of course, excludes those who are not ripe for, or are otherwise unfitted for, the exercise

of the right of voting. The character of the French Convention was not so much due to the system which created it, as to the unsuitability of the people upon whom it fell, to apply the system. The great landowners and property holders of the England of the eighteenth century, had perhaps no natural right to their votes; but the process of deepening and widening the foundations of government, which by this period had reached their level in the State, could not stop there.

Mr. Lecky acknowledges his keen admiration of the "middle class" in government. "It is not the class most susceptible to new ideas or most prone to great enterprises; but it is distinguished beyond all others for its political independence, its caution, its solid practical intelligence, its steady industry, its high moral average. It also, perhaps, feels more promptly and more acutely than any other class the effects of misgovernment, whether that misgovernment takes the form of reckless adventure and extravagant expenditure, or whether—in the not less dangerous form of revolutionary legislation—it disturbs settled industries, drives capital to other lands, and impairs the national credit, on which the whole commercial system must ultimately rest." He believes that the world has never seen a better Constitution than England enjoyed between the Reform Bill of 1832 and the Reform Bill of 1867. Then the constituencies coincided very substantially with the area of public opinion. The public opinion of a nation is laid down here as being something quite different from the votes that can be extracted from all the individuals who compose it. "There are multitudes in every nation who contribute nothing to its public opinion, who never give a serious thought to public affairs, who have no spontaneous wish to take any part in them, who, if they are induced to do so, will act under the complete direction of individuals or organizations of another class." The art of winning and accumulating the votes belonging to these multitudes becomes, under some Constitutions, the chief part of practical politics. "The demagogue will try to persuade the voter that, by following a certain line of policy, every member of his class will obtain some advantage. He will encourage all his Utopias. He will hold out hopes that by breaking contracts, or shifting taxation and the power of taxing, or enlarging the paternal functions of government, something of the property of one class may be transferred to another. He will also appeal persistently, and often successfully, to class jealousies and antipathies. All the divisions which naturally grow out of class lines and the relations between employer and employed, will be studiously inflamed." All quite true; but is it equally certain that the old state of affairs was really better? It was not, as we all know, and could not be, permanent. There was no magic in the formula which made the £10 householder the custodian of the State; and while further "reform" was continually being talked about, public business could not be properly attended to. There would appear to have been more wisdom in the declaration of contemporary statesmanship that, household franchise being inevitable, the only course left to be taken was to educate the "new masters."

Mr. Lecky believes that one of the great divisions of politics in our day is coming to be whether, as the last resort, the world should be governed by its ignorance or by its intelligence. "According to the one party, the preponderating power should be with education and property. According to the other, the ultimate source of power, the supreme right of appeal and of control, belongs legitimately to the majority of the nation told by the head—or, in other words, to the poorest, the most ignorant, the most incapable, who are necessarily the most numerous. It is a theory which assuredly reverses all the past experiences of mankind." But is the alternative quite as the author puts it? What of the lesson conveyed in that most admirable Rectorial Address of Lord Justice-General Robertson, which formed the basis of an essay in the "JOURNAL" for Jan. 14 last? Was there ever an age, it might be asked, when "power" did not actually rest with the majority? There will never be a period when any other condition will prevail, in the last resource. On the other hand, wisdom and character have never failed to lead and employ this power, whenever these high individual qualities have been forthcoming; and there will be no reversal of this action while human nature remains what it is. An appeal lies upon this point from the historian to the judge.

It is not necessary to be a believer in universal suffrage to perceive the fallacy of the argument from Sir Henry Maine, upon which Mr. Lecky mainly relies to disprove the case for it. "Let any competently instructed person turn over in his mind the great epochs of scientific invention and social change during the last two centuries, and consider what would have occurred if universal suffrage had been established at any one of them. Universal suffrage, which to-day excludes free trade from the United States, would certainly have prohibited the spinning jenny and the power loom. It would certainly have forbidden the threshing machine. It would have prevented the adoption of the Gregorian Calendar; and it would have restored the Stuarts. It would have proscribed the Roman Catholics, with the mob which burnt Lord Mansfield's house and library in 1780; and it would have proscribed the Dissenters, with the mob which burnt Dr. Priestley's house and library in 1791." This is all very true; but it means no more than that universal suffrage would not have been good for those periods, nor be at any time competent to deal with some of these issues. Governments based upon universal suffrage are anything but tender in dealing with popular outbreaks; and universal suffrage itself is a "counsel of perfection," waiting for, successful operation, for the era when every man shall be intelligent, educated, honest, and independent.

(To be continued.)

THE LATE JABEZ CHURCH.

IT was with great regret that we had last week to announce the death of Mr. Jabez Church, which sad event occurred at his residence in Holland Park Gardens, Kensington, on the morning of the 20th inst. The cause of death was congestion of the lungs and heart disease, to which Mr. Church succumbed after a short but painful illness.

Mr. Church was born at Chelmsford in 1845 and was educated privately. After finishing his education, he was articled to his father, Mr. Jabez Church, of Great George Street, Westminster, who was also the son of a well-known engineer bearing the same name. Upon the completion of his term of pupilage (in 1869), the deceased gentleman was admitted into partnership with his father; and he practised as a Consulting Engineer in conjunction with him until the death of the latter in 1875. He then continued the practice on his own account; and during his too short career was Engineer to, or professionally engaged for, a large number of gas and water undertakings—enjoying, as his father before him did, a high reputation in his native county of Essex, and not less elsewhere. Among other works in the county which he had either designed and constructed, or to which he was Consulting Engineer, were the gas-works at Braintree, Barking, Brentwood, Chelmsford, Enfield, Epping, Harwich, Ilford, and Saffron Walden, the water and drainage works at Witham, and the water-works at Thetford. Besides these, he was engaged for the Barnet Gas and Water Works, the Colney Hatch Gas-Works, the Cromer Gas-Works, the Dublin Consumers' Gas Company, the Horley Gas-Works, the Woking Gas-Works, and the Godalming Water-Works. Mr. Church was also the Consulting Engineer for no fewer than twelve water-works, all of which he designed and erected. Chief among these, are the water-works at Henley-on-Thames, Great Marlow, Clacton-on-Sea, Barton-on-Humber, Braintree, Halstead, Goring, and those of the Mid-Sussex Water-Works Company. He also designed the Gainsborough Water-Works, which are now in course of construction.

Mr. Church was elected an Associate of the Institution of Civil Engineers on May 23, 1871; and he was transferred to the class of Member, on Nov. 27, 1877, at which time he had already designed and carried out many works of importance, and was Engineer to no fewer than fifty corporations and companies. The deceased gentleman was a Past-President of the Society of Engineers; having been elected to that office two years in succession—namely, in 1882-83—his father having enjoyed the like distinction ten years previously—in 1872-73. He was also a fellow of the Geological Society, and a member of the Meteorological Society. His universal courtesy and honourable conduct disarmed professional jealousy; while his amiable disposition and sterling merits attracted around him a very large circle of friends, to whom his loss will be a deep regret.

[Mr. Church's practice will, we understand, be carried on by Mr. Percy Griffith, Assoc. Memb. Institution of Civil Engineers and Memb. Inst. Mec. Eng., who has been professionally associated with the deceased gentleman for the last eight years, and has been in partnership with him since 1892.]

PERSONAL.

Mr. R. GILLESPIE has been chosen to fill the vacant seat on the Board of the Armagh Gas Company, in succession to Mr. W. R. Ferris, deceased.

Colonel A. R. M. LOCKWOOD, M.P., has been elected a Director of the East London Water Company, in place of the Right Hon. W. Hume Long, M.P., who has retired.

Mr. A. PEIRCE, son of Mr. W. G. Peirce, the Water Engineer of Richmond (Surrey), has been appointed, out of 77 candidates, Assistant-Engineer to the Calcutta Corporation, in succession to Mr. Dickson—a position for which applications were invited in the "JOURNAL" towards the close of last year. Mr. A. Peirce has held an appointment in South Africa; and he is at present assistant to Mr. D. M. F. Gaskin at Nottingham.

"Holophane," Limited.—The first batch of letters of allotment and regret were posted last Tuesday to the applicants for shares in this Company, the prospectus of which appeared in the "JOURNAL" on the 10th inst.

The Explosion of Cyanogen and Chlorine Peroxide.—At a recent meeting of the Chemical Society, the above subjects were dealt with in two communications—one by Messrs. H. B. Dixon, E. H. Strange, and E. Graham, and by Mr. Dixon in collaboration with Mr. J. A. Harper. We shall notice them more fully in a subsequent issue.

NOTES.

Photometric Tests of Incandescent Gas-Burners.

The Surveyor to the Chelsea Vestry (Mr. T. W. E. Higgens) was a short time ago instructed by the Works Committee to make photometric tests of the incandescent gas-burners now in use in the parish. The Vestry's photometer was an antiquated one; and therefore Mr. Higgens arranged with Mr. W. J. Dibdin, the Superintending Gas Examiner to the London County Council, to conduct the trials at their testing-station—Mr. Dibdin kindly undertaking to carry out the tests. Three mantles were tested, as was also a standard argand burner for purposes of comparison; and the results have lately been laid before the Committee in a special report, of which we have received a copy. The first tests were made with a new mantle, using 3·5 cubic feet of gas per hour at a pressure of 11-10ths of an inch; and its average illuminating power, was 52 candles, or, when corrected, 55 candles. Tests of a mantle which had been in use four days, using 3·55 cubic feet per hour, showed an average of 47 candles, or 50·1 candles corrected. The third group of tests, with a similar mantle and a clouded chimney, and using 3·4 cubic feet of gas per hour, gave an average of 32 candles, or 34·2 candles corrected. The standard argand burner gave, with consumptions of 3·5, 4·7, and 5 cubic feet of gas, 6·3, 13·9, and 16 candles corrected. The mantles were tested on different sides; and the variation of illuminating power was as much as 4 candles. This will be seen from the following readings: New mantle, 54, 51·5, 50, 54 candles; used mantle, 46, 50 candles; used mantle and clouded chimney, 28, 30, 31·5, 36 candles. The dirty chimney was used to give an idea of the actual loss of candle power after it had been for some time in service. Mr. Higgens says the result of the tests shows that while the illuminating power of the incandescent gas-lights is much superior to that of ordinary burners, the falling off "after the mantle has been in use for a few days, or the chimney is clouded, is very considerable." It is obvious, however, that the incandescent burner, even under these conditions, has a duty which would be regarded as high in comparison with anything else than its own best.

The Rare Metals in Incandescent Lamp Manufacture.

Now that the incandescent gas-burner litigation has concentrated attention upon the peculiar qualities of the oxides of the "rare earths," it may be of interest to note that an American electrician, Mr. J. W. Aylsworth, is reviving the attempt to utilize these substances, or a modified form of some of them, to improve the efficiency of the incandescent electric lamp. It is generally understood that Herr von Welsbach first studied the behaviour of the oxides of the rare metals with this object, before he was led to make what has turned out to be the more fruitful application of the same substances to improve the lighting effect of coal gas. Mr. Aylsworth, in a communication to the "Electrical Engineer," argues that since by using the heat of an atmospheric gas-flame to heat a mantle composed of certain infusible rare earths, Herr Welsbach succeeds in largely increasing the light to be obtained by the combustion of a certain quantity of gas, it must be concluded that the amount of heat-energy converted into light depends greatly on the emissivity of the substances heated. Many inventors have tried to apply this principle to the incandescent electric lamp, which has great capacity for improvement, seeing that the lamps in actual use convert into light only 5 per cent. of the total electric energy supplied to them. Mr. Aylsworth has accordingly been experimenting with such refractory metals as niobium, tantalum, molybdenum, titanium, zirconium, and others of the same character. His method consists in preparing a lamp filament by heating a base or support in the vapour of a volatile halogen compound of the element which it is desired to deposit, mixed with a reducing gas, such as hydrogen. Mr. Aylsworth's apparatus was described and illustrated in the "Electrical Review" for March 13. It consists of a chamber capable of being heated by bunsen gas-burners, into which is inserted a bulb containing the filament and the compound by which it is to be treated. He takes, for example, niobium oxide, prepared from the ore columbite, and converts this into a volatile halogen compound by the well-known process of mixing it with charcoal and heating to a high temperature in a current of a dry halogen such as chlorine or bromine. When the filament is placed over this halogen compound, and heated, a stream of the reducing gas, as hydrogen, is passed through the containing bulb, while the filament is raised to incandescence by the passage of a current of electricity. The result is the deposition of pure niobium, or whatever metal may be the basis of the halogen compound, upon the filament; and in this way a coating of any desired thickness may be procured. As a measure of the utility of the plan, it is stated that a niobium lamp, so prepared, has been run for some months past, and shows very high efficiency and long life; but no figures are given in support of this claim.

The Adulteration of Petroleum Oils.

In connection with the case that is sought to be made out for the raising of the flash-point of mineral burning oils, it appears from a statement by Mr. H. Schweitzer, of New York, that such a stipulation opens the way to a new kind of fraud by those who prepare American petroleums for the market. This consists in making up oil from a mixture of "tops and bottoms"—*i.e.*, naphtha and the last boiling, or heavy oil. It is stated that these mixtures can be made to show the same flash-point and specific gravity as the best burning oils; and as the boiling-point is also the same, only an exact fractional distillation would furnish means for detecting the adulteration. For this purpose, Mr. Schweitzer advises the use of the solidifying test generally, which also shows the amount of solid paraffins present in the oil. Upon this, Herr R. Kissling remarks that he has used the solidifying test daily for at least twenty years, not because of its supposed value as a test of the burning and illuminating power of the oil, but because the separating out of the paraffins in cold weather might give rise to great inconvenience. For applying the test, Herr Kissling makes use of an appliance consisting of a couple of concentric tin cylinders, containing a mixture of ice and salt. Into this, standing upon a cork plug, is inserted the oil in a glass tube which also contains a thermometer. According to Herr Schweitzer, one of the large American railway companies demands that oil flashing at 150° and 175° shall remain clear when cooled and kept for ten minutes at 1° Fahr.; and 300° oil must remain clear when cooled to 32° Fahr.

Mr. Irminger on the Ball Nozzle.

As considerable attention is being given to the phenomenon of the "ball nozzle" recently introduced into this country as an "American novelty," it may be interesting to state that Mr. Irminger, the well-known gas engineer of Copenhagen, some time ago gave an explanation of the phenomenon, in a paper contributed to the Institution of Civil Engineers. He described it as produced by an apparatus of French origin, consisting of "a wooden ball, about 2 inches in diameter, and a small hemispheric bowl fitting the ball, which in the middle has a hole with an india-rubber hose. If one lays the bowl to the ball and blows through the pipe, the ball will be pressed against the bowl and can be lifted up. The reason is that a rarefaction of the air is produced in the space between the two bodies, as the air sweeps past the surfaces parallel thereto." The same experiment, Mr. Irminger stated, might be made by laying one plane above another, and blowing through a pipe placed vertically through one of the planes. This produces the same effect as sucking through the pipe—that is to say, the two planes will be attracted to one another the more strongly as the wind pressure is increased. For the same reason, when wind blows over a gasholder floating in water, the effect is to lift the holder, and so diminish the interior pressure. It does not appear to have occurred to Mr. Irminger to apply the ball-and-socket arrangement to the production of a fine spray, which is the purpose of the ball-nozzle as now made.

Alternate v. Continuous Current Arc Lamps.

An important study of the manner in which the alternating electric arc lamp gives its light has been made by Professor Fleming and Mr. Petavel. The results so far obtained have been communicated to the Physical Society. The first point examined was the distribution of light over the various radiating regions in the arc. By means of a series of mirrors and a rotating disc carried by a synchronizing alternate current motor, the mean value of the light taken from any part of the arc was compared with the instantaneous value of the light from the same part of the arc, and taken at any assigned instant during the period. Thus the arc was its own standard for comparison. The facts observed are summed up as follows: The purple light of the true arc undergoes a periodic variation, and, as far as the eye can judge, is completely extinguished for a certain interval during the phase. It has equal maxima values during the period, at instants slightly lagging behind the instant of maximum power expenditure in the arc. On the other hand, the illuminating power of the carbon crater varies between a minimum value and two unequal maxima. The authors also endeavoured to compare the efficiency of the alternate current arc, regarded as a light-giving agent, with a continuous current arc taking the same power. Employing two arc lamps which may be regarded as typical of those in general use, the mean spherical candle power of both was determined for equal expenditure of power in the arcs; and it was found that, for the alternating current arc employed, the total mean spherical candle power was always less than that of the continuous-current arc.

The London County Council's Water Transfer Bills.—At the meeting of the Parliamentary Committee of the London County Council last Thursday, a resolution was passed expressing regret that the members of Parliament in charge of the Council's Water Transfer Bills did not report to the Committee the tenor of their negotiations with the Government, so that an opportunity might have been afforded of expressing an opinion as to the course to be adopted in the altered circumstances. The voting upon the motion, which was brought forward by Lord Onslow, was very close; and it was carried by a majority of one. It is curious to note the recurrence of this bare majority in the voting upon the London Water Bills. It was a much more substantial one that rejected the Transfer Bills last Tuesday; and "Engineering" thinks the action of the Lower House will be regarded by Londoners with a feeling of relief.

COMMUNICATED ARTICLE.

GAS-PIPES AND STEAM-ROLLERS.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

The steam road-roller appears to be generally adopted, not only on the principal thoroughfares of our populous towns, but also for side-streets, and in suburban and even country districts. The results attendant upon its use may be regarded as satisfactory by surveyors and those responsible for the condition of the roads. But the owners of the gas-pipes laid under the soil can scarcely look upon its adoption with equal complaisance. It has been remarked that the steam-roller finds out the weak places, which is certainly correct. A gentleman is referred to in Longfellow's poem, "The Luck of Eden Hall," who experimented on a valuable piece of old pottery in a similar way; but his procedure does not recommend itself as in accordance with the ordinary dictates of common sense. Some of the so-called weak places that are discovered by the aid of this novel method of investigation, have never proved a source of leakage during a twenty or thirty years' existence; others certainly never existed before. So, while the steam road-roller may be a useful machine from the road-makers' point of view, I do not regard it as of any use whatever in connection with the testing of gas mains and services for soundness. There is no case on record of its having proved of any benefit in reducing the leakage account. On good roads, accustomed to carrying a large and heavy ordinary traffic, including four-horse vans and traction-engines, and that have been well maintained and kept in good order, the steam-roller does not put itself much in evidence. But when one of these implements is for the first time put upon a by-street or a country road accustomed to small and light traffic, which has received but little attention in the way of maintenance beyond an occasional scrape in unusually wet weather, and a sprinkling of stones from a cart at rare intervals, the gas engineer becomes more intimately acquainted with "The Luck of Eden Hall" properties possessed by the steam-roller, than is good for his own comfort or for the prosperity of his undertaking. Difficulties from drawn services and fractured mains—ranging from the slight crack a few inches long, up to the complete severance of the pipe—become common occurrences; amenities arise between the Corporation officials who have just made up a good smooth road and the gas-works men who go and make it rough again; and much misapprehension exists as to the actual cause, though it need scarcely be added that the gas company are saddled with the blame. Following on the lines of the usual rule that if the gas gives a bad light the company are at fault, it is argued that if the gas-pipes break they must be bad pipes; and many members of corporations, &c., arrive at the conclusion that there must be special negligence in putting down, or in selecting the sections or quality of, the pipes to be used for the conveyance of gas. So far from getting any sympathy in their misfortune, which has arisen from causes that could not possibly have been foreseen, the unfortunate gas company are blamed for not laying their pipes at a reasonably sufficient depth, or for purchasing cheap stuff of a rotten or ginger-bread character. A common argument in support of this view is the fact that gas-pipes are injured more frequently than water-pipes.

Now it is not the practice with gas companies to buy cheap pipes without regard to quality, or to stint the cost of excavation when laying, though it is quite true that water-pipes are, under ordinary circumstances, both thicker in section and laid at a greater depth. This is not because water engineers are more prudent, or have exercised more care or foresight as to possible contingencies, or generally do their work in a stronger or more substantial manner, than gas engineers. It is simply a natural consequence due to the different nature of the service performed. The internal pressure to which the gas-pipes are exposed is a mere trifle—a matter of a few ounces per square inch. But water-pipes are subject to heavy pressure in low levels, representing a large number of pounds per square inch. Gas-pipes in themselves are not interfered with by frost, except as regards its effect on the soil surrounding them; but the formation of ice in water-pipes must be prevented, as it not only stops the supply but also fractures the pipe. It would be as reasonable to adduce the fact that the main-sewers are never injured by the roller as to compare water-pipes with gas-pipes. The main-sewer must, for obvious reasons, be laid at a depth of 6 to 8 feet, which is sufficient to put it out of reach of surface troubles under all ordinary circumstances.

The ordinary main-road traffic, either in town or country, includes heavy vans, traction-engines, and other vehicles carrying quite as heavy base loads as the steam-roller; and this implement itself travels the roads to a considerable extent in going backwards and forwards to its work. Yet one very rarely hears of injury to gas mains or services as the result of ordinary traffic. The drawn service or fractured main is never heard of except where the steam-roller has been at work, and worked (as will presently be shown) in a particular way. In my own experience, I only know one instance of a gas-main being broken by a traction-engine; and the circumstances under which this unusual occurrence took place are interesting in connection with our subject. A hydrant situated at the edge of the footwalk was constantly and regularly used for filling watering-carts—a process attended with some slopping and spillage, which had been sufficient to penetrate the ground and render it quite soft over a good sized patch. A traction-engine pulled up to take a supply of water—the trifling objection that this was contrary to regulations being adjusted in the usual way—and one of the wheels sank a few inches in the soft place, with the result that a 3-inch gas-main that happened to be just exactly underneath was broken. It was completely severed; and the broken parts were displaced almost clear of each other. Being a connecting main supplied at both ends, a very serious escape of gas followed—sufficient to completely frustrate attempts to bare the pipe at the spot; and it was necessary to go back some yards each way and cut off the main on either side. This having been done, examination showed that the soakage had completely demoralized the soil, not only down to, but also for some inches below, the gas-pipe. The road was on "made" ground—being, in fact, the site of an old brickfield; and the soil was simply rough garden mould, so that the effect of the soakage was to cut away the support below the pipe as effectually as if it had actually been dug out. The result of the settling at the surface was to lower the level of the wheel that did the mischief—thus canting a considerable part of the weight of the whole machine directly on to the line of gas-piping, which was thus called to act as a principal bridge girder; and, as might naturally be expected, it proved to be not strong enough for that purpose.

When the steam-roller was first introduced into the districts with which the writer is directly concerned, the main and service layers made a complaint about its being applied to freshly disturbed trenches. Directly they had finished a new service, the roller was sent to obliterate, if possible, the evidences of their work; and they considered that the pipes, being unprotected by consolidated ground, would scarcely escape injury. But they soon observed that no harm followed, provided the roller did not actually sink in the newly filled-up trench. In fact, the practice was of benefit to the gas company rather than otherwise; for the men took more particular care in the way of seeing that the main was well packed underneath, and looked out good solid stuff to fill in round the junction of the services. Neglect of proper attention to this point, is responsible for an important factor in the leakage account. There is no instance on record of injury to new work by this practice. A useful insight into the mysteries of the roller action (which not only explains this but also other matters) may be gained by watching the implement at work on a mound over a recent excavation situated on the crown of the road, or left somewhat high, as compared with the neighbouring surface. The reduction of the excrescence is somewhat slow; so much so that sometimes a hardy labourer provided with a can of water and a rammer, could give the machine several points. It will be observed that as long as the roller is level, the weight is equally distributed; but directly it is tilted or canted on one side, this condition is disturbed. The greater part of the weight is transferred to the lower side; and this is why the high mound escapes. If the soft place happens to be lower (instead of higher) than the normal level, the action of the roller is much more rapid. In the case of the new excavation, this is a great advantage; but when the gas-pipe happens to be laid under the lowest part of the road level, it is a great disadvantage. One may safely say a large percentage of the total breakages are due to the canting or tilting of the roller, which throws the largest part of the weight just in the weakest place; and they would not occur if the roller never deviated from the horizontal.

Road surveyors appear to have generally adopted, by common consent, something like a bow or segment shaped cross section, as best suited for roads. As compared with the segment of a circle, it is rather flat at the crown, and exaggerated towards the sides at the gutters. This is quite a new idea as regards many of our roads. The cross section has been left to chance; and there has been no endeavour to preserve any special shape, so it has settled down into an irregular approximation to the horizontal. The centre of the road tends to wear down more rapidly than the sides; and the custom was to compensate for this with an occasional thin dressing of stone. This was not done with any regularity; but there was a regard for economy of material and labour which occasionally traversed so far as to reach actual neglect, and arouse complaints from the inhabitants of the neighbourhood. Sometimes twenty or thirty years have elapsed without anything more than this piecemeal procedure, or any attempt at renovating the road right across from gutter to gutter. The outside edges were not touched at all. The road was scraped in muddy weather; and it frequently happens that more has been taken off the road in the form of mud than has been put on in the form of metal. So that, in course of years, the actual level of the road has lowered some inches. In many parts of Wiltshire where the soil is marly, and also in Devonshire where it is red, the characteristic colour of the subsoil appears at the sides of the road—showing that the scant dressing of metal is sinking. When the rainy weather comes, the mud is scraped off, and nothing is put on to take its place. The effect of this action going on for a long period of years, is unfortunate for the gas company. The main pipe, originally laid at the usual 18 inches clear depth, comes within about a foot of the surface. Service-pipes laid across the road, begin to show up through the

ground in the vicinity of the gutter on the other side; and though originally connected by bends tapped in on the top of the main, it is found that they must be put into the side if a proper fall is to be maintained. I have seen old main-pipes in which all the services had been transferred from the top to the side for this reason. If they had been originally laid in this position, it is obvious that the services would have been tapped into the sides in the first place. I have seen service-pipes showing in the gutter in places where they were certainly well out of of sight a few years ago. This state of things is unfortunate for the gas company in two ways. It greatly increases the risk of injury and damage to their plant; and it subjects them to the unjust accusation of negligence in laying their pipes in the first place. Whether a sufficient period has elapsed to allow denudation to obtain to any great extent, or whether the supply of road metal has been sufficient to compensate for the scraping to which the road has been subjected, the result is the same. There is a layer of road metal or stone—thickest in the centre tapering out to almost nothing at the edges—resting on a more or less sodden and unstable subsoil, and having a rough approximation to the horizontal in cross section.

If a modern road surveyor comes down upon a road in the condition above indicated, with his 10, 15, or 20 ton roller, and sets to work to convert it into a consolidated, bow-shaped with clearly marked gutters, and regular surfaced road, the result is a considerable displacement of the soil. The cumbrous mplement ploughs its way along, making a wave-like depression as it goes; and the adjacent surface shakes like a jelly. The surveyor is rather pleased at this displacement than otherwise, as it enables him to attain the desired end with a minimum of new metal. The centre is made up first, and kept at about the normal level; and the sides and gutters are simply forced down. The ground near the gutter, carrying only a thin layer of metal, will give to any extent, especially if there is nothing to confine it outside. There is not only downward, but also lateral displacement under the foctpath. I have seen a granite footway curbing forced out of the perpendicular, and turned in over the gutter, leaving cracks an inch or more in width on the footpath, and also the footway heaved in great bulges, where the roller had been put upon a badly made and badly kept road. The roller has cost a considerable amount, and is expected to show some economy in material; and therefore there is every inducement to follow this way of procedure, rather than to give the thoroughfare a good dressing of metal from gutter to gutter.

Most of these roads have been provided with gas and water mains and a sewer, all of which have been laid before the making of the road was complete. The sewer has been laid in the centre of the road, at a sufficient depth to get the necessary fall from the houses, which will not be less than 6 feet. The water-pipe is well away to one side, and laid a good 2 ft. 6 in. deep. And then the gas-pipe comes somewhere near the gutter, and has been laid at a clear depth of 18 inches, in accordance with the usual practice. If the water-main belongs to the local authority, the gas company have no choice but to accept this position. Bearing in mind the foregoing remarks on the effect of the roller when out of the horizontal, and also on the displacement of the soil, it is easy to see why the gas-pipes suffer more than the water or the sewer pipes. They are just in the place where the soil is weakest, and consequently the displacement is greatest; and they are probably the only line that experiences the full effect of the lateral as well as the downward strain. In addition to the natural weakness of the subsoil, there are places where the ground under the gas-main has been disturbed for sewerage or water purposes.

There is also a tendency to increase the weight of the roller. Most surveyors have a suspicious leaning towards the 20-ton implement; nor is there any guarantee that they accept this as the maximum, except the fact that the breaking load of the bridges in the neighbourhood is being approached. If a much heavier load is tried, it may be expected to crush through some bridge, and fall into the river; and many gas engineers would not object if there were a few weak bridges in their districts. But however that may be, it must be acknowledged that gas companies only occupy the roads by sufferance, and that the authorities are quite entitled to roll as much as they like. With regard to pipes already laid, the gas company are entitled to some sympathy. They provided for every known contingency, and used every reasonable care; and it is their misfortune, and not their fault, that the roller has subsequently come upon the scene. But although they could not possibly have provided against the roller in bygone days, the case is different now; for it behoves every gas engineer, when arranging for laying new lines of main, to consider the necessary means for securing himself from trouble and loss by the action of the roller. With regard to pipes already in the ground, it is a matter for good feeling between the road men and the gas-works employees, who should co-operate to avoid damage as far as possible, or to minimize the risk of loss or accident when this has really occurred. But in laying new pipes, care should be taken to keep away from the gutters. The time-honoured 18 inches clear must give place to a depth based upon particular circumstances in each case; and the "gas section" may be discarded in favour of "water section." When iron was £20 per ton, this was an important matter; but now that main pipes are delivered in many districts for less than £5, the additional weight is not a serious item. The small pipes are also weaker than the larger. A 3-inch pipe breaks more readily than a 4-inch one; and a 4-inch goes sooner than a 6-inch. So that, in addition to the usual arguments in favour of pipes of ample size, there is the consideration that the larger pipe is the stronger. Tapping 3-inch or 4-inch pipes for services is also a considerable source of weakness. A 1-inch service in a 4-inch pipe means cutting out about one-eighth of the total section. Boss-pieces should be used for 1-inch or larger services; and in any case the junction may be strengthened by saddle-pieces or clips. The substitution of "water section" for "gas section" may also be extended to the wrought-iron service-pipe. And in the case of new roads consisting of made or otherwise soft ground, it is better to let the roller have a few preliminary trips over the site before laying the gas-main.

TECHNICAL RECORD.

INCANDESCENT GAS-LAMPS FOR PUBLIC LIGHTING.

A Meeting of the Association of Municipal and County Engineers was held at King's Heath, near Birmingham, last Saturday. Mr. E. R. S. Escott, M.Inst.C.E., the Borough Engineer of Halifax, presided; and there was a good attendance —most of the Metropolitan districts and the large Provincial towns being represented.

Mr. R. Godfrey, the Engineer and Surveyor to the King's Norton Authority, read a paper descriptive of fourteen years' work in a Midland suburb. Referring to the public lighting and the introduction of incandescent lamps, he said that in 1883 and 1884 an attempt was made in Parliament to sever the gas supply of the district from Birmingham; but it was not successful. At that time, each public lamp cost £2 8s. 6d. per annum, including all repairs, lighting, &c. In 1885, the outside Local Authorities were offered gas for street lighting at 12-25ths of the lowest current price per 1000 cubic feet. Large consumers then paid 2s. 1d. per 1000 cubic feet; so the offer meant gas at 1s., provided the cost of lighting, maintenance, &c., was undertaken by the Local Authority. This offer was at once accepted; and it immediately resulted in a saving of £500 per annum. The average cost now, including gas, was 32s. per lamp; so that on 1050 lamps a saving of £866 5s. was effected. The incandescent system had been applied to 76 lamps. The difficulty of lighting from the outside of the lanterns, and of protecting the mantles against the effect of the wind, had been overcome by a device which could be seen in the lamps in the High Street. The statistics for 25 of the lamps fitted with the incandescent system were—

Present consumption, twelve months ending Dec. 18, 1895	12,651 c. ft.	
Previous consumption, twelve months ending Sept. 28, 1894	39,020	,,
Saving on each lamp	26,379	
Do. on the 25 lamps	659,475	
At 1s. 1d. per 1000 cubic feet	£35	14 4
Discount at 5 per cent.	1	15 9
Net saving in gas	£33	18

The total number of mantles used and chimneys replaced was—

Mantles, 227, at 1s. each	£11	7 0
Chimneys, 77, at 1s. each	3	17 0
Forks, 19, at 1d. each	0	1 7
Total	£15	5 7

Leaving a net gain of £18 13s. by the use of incandescent burners. The cost of the burners and fittings, at 16s. each, was £20; so that the first year's saving in gas left only 27s. capital cost to be met out of next year's savings. The largest number of mantles used by any one lamp was 14; the smallest, 6.

Mr. A. T. Davis, the County Surveyor of Shropshire, said it would be interesting if Mr. Godfrey would explain why he lighted the incandescent lamps by his plan rather than by the bye-pass to which they were so accustomed.

Mr. Godfrey said he found the bye-pass damaged the mantles more than the explosion on lighting. He also found that the bye-pass was often blown out. He tried the bye-pass burners; but they were not successful. At the present time, the cost of an installation would be only half what it was eighteen months ago. It was then 16s. a lamp; now it was 8s.

Mr. T. A. Bayliss, the Chairman of the King's Norton District Council, asked if there was not some escape of gas from the bye-pass. When a room was lighted with an incandescent burner, and was closed up during the night, he found there was always a smell of gas in the morning.

Mr. Godfrey said it was some substance in the mantle which gave off an unpleasant smell.

Mr. A. T. Davis said he had a burner in his house which had been there since the 1st of January; and it had only gone out once during that time. He never experienced any smell whatever; neither had the mantle broken.

Mr. J. T. Eayrs (West Bromwich) remarked that the members were drifting rather on to the subject of domestic lighting. The subject of the paper was street lighting only, not whether the mantles gave off a smell in a closely-confined room. He had a considerable number of incandescent lamps at work; but he was not at present prepared to give any statistical information as to the life of the mantles, which was the most serious part of

an installation. But, speaking generally as to the system, he thought it had a great future before it. One point they had to try and keep in view was the efficient lighting of the streets, and to exercise the greatest economy in producing the light. If they added incandescent gas-burners to the street-lamps which burned 4 or 5 cubic feet per hour, they obtained no economy in gas, but they had a much superior light. If they employed the bye-pass, they used more gas than with an ordinary street-lamp. He was now trying an experiment with burners constructed to burn 2½ instead of 4½ cubic feet of gas per hour, with very good results. If they put one of these 2½-feet burners in an ordinary street-lamp, and compared it with one of the ordinary burners, they found a very great improvement; and they were at the same time saving about half the quantity of gas. The only place where he was putting 5-feet burners was in cluster lamps, where he used two burners consuming 10 cubic feet of gas per hour instead of five consuming 25 cubic feet.

Mr. CAMPBELL (Canterbury) asked for an explanation of the large saving in consumption of gas. Mr. Godfrey had stated that the present consumption of the lamps for twelve months was 12,650 cubic feet, as compared with a previous consumption of 39,020 cubic feet. He regarded the latter as an extraordinary consumption, as the average of the country was about 20,000 cubic feet.

Mr. GODFREY said all the lamps referred to were burning 10 cubic feet of gas per hour; now they were burning only 4 cubic feet.

Mr. LORD (Hampstead) asked as to the effect of vibration in the streets on the life of the mantles. He found they burned very well in rooms; but when they were put into the streets, the mantles suffered very much from vibration.

Mr. EAYRS said he had a great many lamps fixed on main roads with steam-trams running backwards and forwards, and he had not experienced any difficulty; and no greater destruction of mantles had taken place than in streets without trams.

Mr. WHEELER (Westminster) said he had tried incandescent lamps, and found the vibration ruinous to the mantles. In four months they had 91 mantles to pay for, which doubled the cost of the burners. They had, therefore, abandoned the use of the burners for the present.

Mr. N. SCORGIE (Rotherhithe) said that, having a district subjected to very heavy traffic, he could bear out what had been said by Mr. Wheeler. He had had six lamps fixed as an experiment; and he had used as many as two mantles in a night. They had tried all sorts of burners, and now the South Metropolitan Gas Company thought they had a burner which would succeed.

Mr. COOPER (Willesden) could not see that the use of the spoon arrangement for lighting the lamps had effected any saving in the life of the mantle. In the year which Mr. Godfrey had tried 25 lamps, there had been used an average of nine mantles for each lamp. The average number of mantles used was eight per lamp per annum.

Mr. T. DE COURCY MEADE (Manchester) moved a vote of thanks to Mr. Godfrey for his paper; and it was carried by acclamation.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

The Annual Meeting at Boston.

(*Continued from p.* 566.)

Mr. W. S. Allen, of Boston, read a paper on the demand for higher candle power, and some of the less known methods of obtaining it. With ordinary coal gas, 12 candles was for years the legal standard. But in course of time this failed to give satisfaction; and it was found that, by the use of cannel, gas could readily be brought up to 20 candles. The expense, however, was prohibitive, except in the immediate vicinity of the cannel fields. One great advantage in the use of cannel was that it required no alterations or modifications of ordinary plant. When cheap mineral oils came in, it was observed that high candle-power gas could readily be made from them; but the product was liable to smoke. When water gas was shown to be practicable, a method of producing gas up to 30-candle power was at once available. Then, in 1880, when the electric arc was introduced, there was a demand for high-power gas-lamps; and the use of regenerator lamps became general. These were followed by the Welsbach incandescent light; and all this led to a demand for more light from ordinary burners. Passing on to notice some of the methods introduced for meeting this demand, the author first described the Young and Bell process, which, he said, enabled coal gas to be enriched to a high degree with much less liability to smoke than ordinary oil gas. Carburine was used as an enricher at the outlet of the holder. This was a light petroleum or shale spirit, consisting mainly of hexane, having a specific gravity of ·680. Ordinary coal gas would carry at least 8 per cent. of it at 30°; and a gallon was sufficient to raise 8000 cubic feet of 16-candle gas one candle. But a more successful enricher was benzol, which had been introduced in Germany by Dr. Bunte. This was also used at the outlet of the holder. A revolving drum dipped into a supply of benzol; and the gas passing over its surface was enriched to the desired degree. A gallon of benzol would raise 25,000 cubic feet of gas one candle; and good permanent gas could be made by this means, up to 25-candle power. Gas would only carry 3·3 per cent. of benzol at 32°, which at first sight made it appear that carburine would be preferable. But this was not so, because benzol was three times as effective. With either hexane or benzene, a 25-candle gas could be made that would not cause trouble from smoke, or (under ordinary circumstances) from condensation in the pipes. Acetylene was very permanent, and also possessed high lighting value; but it had been found useless for enriching carbonic oxide, or blue gas. Perhaps, however, it might be turned to account for this purpose by converting it into benzene, which could readily be done by passing it through red-hot tubes. Looking at the fact that a large quantity of gas was used for other than lighting purposes, and that the incandescent light required the heating properties only, the value of the enricher in this respect should not be overlooked. In conclusion, the author much questioned whether, instead of trying to increase the lighting effect, it would not be better to have smaller burners. It was possible they had gone too far in the direction of high candle power; and that it would be advantageous to direct attention to obtaining less light from each burner, together with the use of more burners.

Mr. Taber opened the discussion by asking the author's opinion of Professor Lewes's experiments on the heat of the acetylene flame. He thought that high heats in the retorts increased the production of benzene, and therefore improved the quality of the gas. Mr. Gifford said he would like some idea of the relative cost of carburine and benzol. Mr. Allen, in reply, said that up to last year there was a fairly general agreement as to the actions in the gas-flame; but since then all the old theories had been broken up, and now there appeared to be considerable variety of opinion. The actual separation of particles of carbon formed the light; but he could not find out what happened beyond this. As to the cost of benzol, it was not really on the market in America; and the price was much greater than in Europe, where it competed with shale oils in price. The quantity in ordinary gas depended more on the quality of the coal than on the heats. He would have liked to have heard some discussion on the distribution of light in ordinary rooms.

Mr. W. B. Addicks, of Boston (Mass.), read a lengthy paper on "Acetylene Gas." He described a visit to Spray (N.C.), where the Willson Aluminium Company were manufacturing calcium carbide. The plant comprised coke and lime sheds, crushing, grinding, and mixing machinery, water-wheel, dynamos, transformers, furnaces, &c. The furnaces were built in pairs, with a central partition. The hearth, or base, consisted of an iron plate 2 inches thick and 20 inches square, which was attached to one pole of the dynamo. The other pole was connected to a carbon electrode or pencil, which passed through the centre of the roof, and could be adjusted at any desired height. Several inches of carbon were laid on the hearth; the pencil was let down to the lowest position; and the space surrounding it was packed with the coke and lime mixture, which had previously been well mixed in the proper proportions, to a depth of 12 inches. The current being turned on, the calcium carbide was gradually built up in a rectangular ingot, corresponding with the shape of the pencil, which was gradually raised by an attendant, who was guided by the indications of a voltmeter and ammeter; and a sufficient supply of mixture was added from time to time to keep the end buried to the extent of about 12 inches. The formation took place at the rate of about one vertical inch in five minutes; and when the top of the arch was reached, the current was stopped, and the ingot was left for four hours to cool. It was then removed, cleansed from loose material (which could be used again), and broken up for packing. Its quality was tested by taking a weighed sample, adding water, and measuring the gas given off. Attention was next directed to the properties of calcium carbide and acetylene. Water at 60° Fahr. and 30 inches pressure, would dissolve eleven times its volume of acetylene. When submitted to cold and pressure, it formed a liquid having a specific gravity of ·42; and when the pressure was removed and the temperature raised, it returned to a gaseous form—1 cubic foot of liquid forming 400 cubic feet of gas. At Spray, 1·17 parts of lime were mixed with 0·83 of coke; and in one test the author witnessed, 231 lbs. were made in 2¼ hours. About 5 per cent. of this was scraped off as slag, leaving 219½ lbs. net. The ampérage was 1310, and the voltage 100; and the net electrical horse power at the point of the carbon was 169. The theoretical yield from 1 lb. of carbide was 5·93 cubic feet; but two samples tested by the author gave an average of only 4·31 cubic feet. In a second test, the yield of carbide was less per electrical horse power; but the quality was better, as it gave 5·13 cubic feet of acetylene per pound. The author considered that a fair yield per electrical horse power per 24 hours, was 10·6 lbs. of carbide, equal to 53 cubic feet of acetylene. Some power was required for grinding and mixing, and there would also be waste; so that altogether he considered the actual power required to be 140 per cent. of that actually developed at the point of the pencil. After going into figures as to the outlay for labour, repairs, &c., the actual cost was figured out at £4 15s. per short ton (2000 lbs.) of carbide produced. The plant at the works of the Philadelphia Carbide Manufacturing Company was next described. Here the details are rather different; the mixture being supplied in iron crucibles, into which the carbon electros

dip. The ingot is also built up from bottom to top; but the machinery generally is on a larger and more elaborate scale than at Spray. This plant has not yet been put to work; but it is estimated as capable of producing 5 tons of carbide a day. Some properties of liquid acetylene were then considered; the author pointing out that when a gas—such as oxygen—was liquefied, the process was attended with a great reduction of pressure. Conversely, a liquid, while undergoing gasification, might give an increased pressure. At 99° Fahr., acetylene was a gas, no matter what the pressure was; and if liquid acetylene was raised to that temperature, there might be a considerable increase of pressure. As a liquid at this temperature, it would exert a pressure of 1000 lbs.; but as a gas, it would give 400 atmospheres, or 6000 lbs., per square inch. This action could not take place suddenly, because the change from liquid to gas involved the absorption of heat. Possibly 4000 lbs. per square inch would be a sufficient pressure to provide for; but before dealing with liquid acetylene on a commercial scale, this point should be thoroughly investigated. Some laboratory experiments were quoted, showing that calcium carbide in slacking gave out 1¾ times as much heat as pure lime; and the average yield of several samples was found to be 4·65 cubic feet of acetylene per pound.

Discussion having been invited, Mr. Taber said the President had remarked in his address that the idea of supplying consumers with cylinders of liquid acetylene had been given up, in favour of the distribution of it from small centres. At present, it appeared to him (Mr. Taber) that the latter plan was not free from danger. Mr. Clark said he had found that the addition of 1 per cent. of acetylene to coal gas raised the quality 1½ candles; but with blue water gas, 15 per cent. of acetylene was required to get any illuminating value at all, though after this proportion the enriching value rapidly increased. Mr. Nettleton said that the author had taken the cost of power at about 21s. per day of 24 hours. This rate of payment would not give a fair return on the plant; and the cost of the power would be five to ten times as much, according to the locality. Mr. Clark would have been pleased to hear something about the cost of freightage, packing, &c., as the real question was not what the carbide cost at Spray, but what would be the price of it at his own works. It seemed to him that it must be made at or near the gas-works; and to most of them it would be a question of steam, and not of water power, for making the carbide. He therefore wished to know the figure at which it could be made by steam power in Massachusetts, or what the cost of transit from Niagara would be. Mr. M'George said that the carbide could be shipped in ordinary barrels, and had to his knowledge been conveyed some hundreds of miles in this way. In one case, the bung fell out of the cask; but no trouble followed. He had actually asked for rates from Niagara to Boston, and was quoted 13s. 4d. per ton. There would be a slight loss—perhaps 1½ per cent.—due to shipping in casks. Mr. Taber thought that gas engineers in New England would have to pay about £14 per ton for the carbide. The President remarked that the question of pressure in the cylinders was very important; and there was much difference of opinion about it. The author had spoken of 6000 lbs.; and some said this was too much, while others thought it was too little. Mr. Addicks, in reply, said that he was not particularly favourable to the use of cylinders. In the explosion at New Haven, it would appear that dissociation of the carbon and hydrogen had taken place; and it had been said that under such circumstances a pressure of 20,000 lbs. per square inch would be generated. He had not attempted the use of acetylene in a practical way, but had simply experimented with it, as others had done.

(To be continued.)

A New Chemical Thermometer.—A fresh attempt at the construction of a chemical thermometer is reported in the "Comptes Rendus" as having been made by M. Georges Lemoine with, it is claimed, some success. M. Lemoine makes a mixture of ferric chloride and oxalic acid; and he finds that there is a relation between the amount of decomposition and the intensity of the light which provokes it.

The London County Council and the South Metropolitan Gas Company's Bill.—At the meeting of the London County Council last Tuesday, the Chairman of the Parliamentary Committee (Mr. M'Kinnon Wood) withdrew his motion, referred to last week, to sanction opposition by the Council to the South Metropolitan Gas Bill, and to charge the expenses to the county fund. The Bill stands for consideration by the House of Commons Committee on the 14th prox.

The Miners' Conciliation Board.—A private meeting was held at the Westminster Palace Hotel last Wednesday, to discuss the question of the continuance of this Board. Mr. A. Hewlett, on behalf of the coalowners, made the following proposal: "That the Conciliation Board inaugurated at the Rosebery Conference, and as now established in conformity therewith, be continued, to determine from time to time the rate of wages on and from Aug. 1, 1896." Mr. Pickard made the following proposal: "That the agreement now in existence be continued till Aug. 1, 1896." After considerable discussion, it was agreed that the two proposals should be submitted to the coalowners and miners in every district. The meeting was adjourned till the 30th prox.

REGISTER OF PATENTS.

Overhead Gas-Lamp.—Thomas, T. C. J., of Harlesden. No. 435 Jan. 7, 1895.

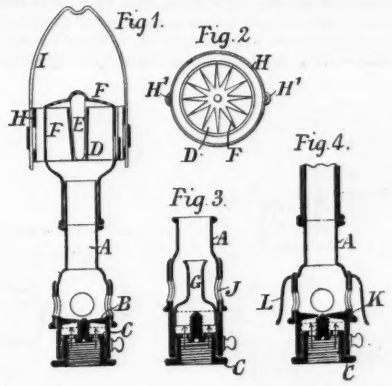
This gas-lamp is designed for special use for burning oil gas in railway carriages; but it is also applicable for burning ordinary coal gas. The reflector at the top of the lamp-bowl is provided with inwardly projecting flat-flame burners, above each of which air-inlets are provided so that, when the lamp is burning, air will impinge upon the upper surface of the flame, extending from each burner (when two or more are used), and impart a curved form to the flame, and direct it towards an exit opening in the upper part of the reflector. The air-inlet openings are protected by a baffle of truncated conical form, secured to the reflector so as to carry the lamp chimney; the arrangement being preferably such that the air supplied to the flame will not be heated to any considerable extent. The burners are in connection with a gas-box arranged to be cooled by the inflowing air. The upper part of the reflector is provided at the underside with baffles, arranged to check air issuing through the inlets in the reflector from passing direct to the chimney without impinging upon the upper surface of the flame.

Supports for Incandescent Gas Mantles.—Moeller, J., of Palmer Street, Westminster. No. 4129; Feb. 26, 1895.

This invention relates to the central stems used to support incandescent gas mantles; the stem being made with an eye open at one side, into which is introduced the asbestos thread. The stem is extended some distance above the eye, so as to form a handle by which the stem with the mantle suspended on t can be lifted.

Incandescence Gas-Burners.—Besson, A., of Paris. No. 6690; April 1, 1895.

This invention refers to an incandescence gas-burner, the chimney of which is provided with a diaphragm having a gas-exit hole through it at centre, and arranged to be connected by screwing to a nozzle or part carrying a conical projection—the arrangement being such that the delivery of gas can be controlled by screwing the burner chimney or tube to or from the conical projection. The chimney or tube A (fig. 1) of the bunsen burner is provided, at a certain distance from its base, with a diaphragm B, of conical form, and through which a hole is made at its centre. In the lower part of the chimney is screwed a piece C formed with holes, and furnished at its centre with a small conical projection, which may either be rigidly fixed in the piece C, or be regulatable therein, as regards height, by screwing or by other suitable means. At



the base of the chimney are two ears or a milled part, to enable the chimney to be more or less screwed on the piece C, so as to cause the conical projection to enter the hole in the diaphragm to a greater or less extent, in order thereby to diminish or to increase the volume of gas passing through the diaphragm, and thereby regulate the intensity of the light.

At the top of the chimney is the combustion chamber D, in which there are arranged a cone E, for deflecting the mixture of air and combustible gas from the centre towards the periphery, and a sheet of metal F, folded into a wing or star-like form, as seen in the plan (fig. 2), or spirally, or arranged in any other suitable manner for the purpose of increasing the heat of the flame by recuperation. The recuperator carries a deflecting-cone E; and is placed in or on the combustion chamber in such a manner that it can be easily removed therefrom when desired. On the combustion chamber there is fixed a socket-piece H, provided with eyes for supporting a double rod I, from which the mantle is suspended. The socket-piece is arranged to fit on and around the combustion chamber with slight friction.

For the regulation of the bunsen burner, there may be employed, in lieu of the arrangement described, that represented in fig. 3, in which there is substituted for the diaphragm B a small chimney G, which extends above the holes J provided for the admission of air.

The arrangement shown in fig. 4 is similar to that in fig. 1, with the exception that the regulating-sleeve K of the bunsen burner has attached to its upper portion an annular casing L, which serves both to aid in deflecting the air into the chimney, and also to prevent the entering air from causing the combustion of the gas to take place at the bottom of the burner.

Gas-Engines.—Mackenzie, J. W.; communicated from H. M. L. Crouan, of Paris. No. 6800; April 2, 1895.

This invention has for its object: (1) To enable high speeds to be attained by replacing the usual cams actuating the valves by eccentrics, and making all the parts of the engine absolutely rigid with respect to each other, and the bearing surfaces sufficiently large; (2) to increase

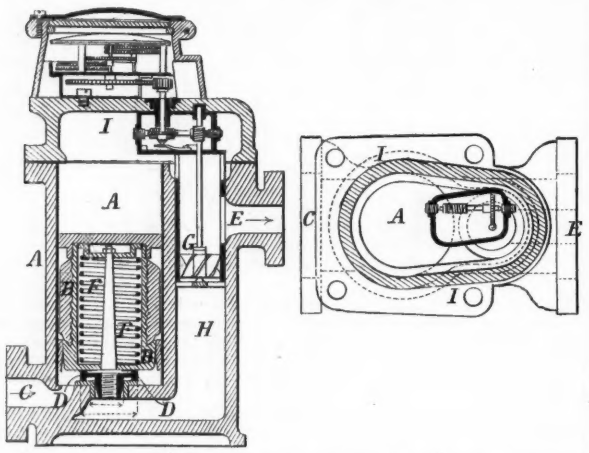
the volume of explosive mixture; (3) to thoroughly clear the cylinder of exhaust products after each explosion, so as to ensure absolute certainty of action; (4) to secure an intimate and instantaneous mixture of the gas and air in the cylinder; and (5) to provide a simple, efficient, and thoroughly adjustable governor.

The inlet-valve of the engine is of the suction type, divided into two parts, for the gas and air respectively. The exhaust-valve is actuated from an eccentric through a connecting-rod, lever, and catch-rod acting on the valve-stem. A second eccentric, revolving at half the speed of the first, draws the end of the catch-rod opposite the end of the valve-stem at each alternate stroke, or when desired to open the exhaust-valve. The eccentric-rod of the half-speed eccentric is in two parts, connected together by a spring pawl on one part, taking into a notch on the other part. At the end of the stroke of the eccentric, the spring pawl is knocked out of its notch against an adjustable stop by a second adjustable stop; and when the speed is too great, the pawl is drawn by the eccentric away from the notch before it can again fall into the notch, so that the free part of the rod is not operated to place the catch-rod opposite the valve-stem until the next cycle. During the instroke of the piston, air is drawn into the casing through a suction-valve; and at the end of the outstroke, the compressed air passes by a pipe to an annular space communicating with the cylinder by a series of openings uncovered by the piston at the end of the outstroke. The air rushes in, and (according to the phase of the engine) displaces the products of the previous explosion, or mixes with the air and gas drawn into the cylinder in the usual way, and increases the volume of the explosive mixture.

Liquid-Meter.—Abel, C. D.; a communication from La Compagnie Anonyme pour la Fabrication des Compteurs et Matériel d'Usines à Gas, of Paris. No. 8068; April 23, 1895.

The engraving shows a vertical section and a plan of one form of meter according to this invention.

A is a vertical cylinder fitted with a heavy piston B. It communicates by a lateral passage C with the liquid supply; and by a central opening having a valve D, with a vertical passage H, leading to a discharge E, and to the upper part I of the cylinder. The entering liquid, under pressure, forces upward the piston B, which drives out the liquid above it through the discharge E—the quantity discharged being equal to that which enters below the piston. The piston is connected to the valve D by a rod having a head-bearing or a helical spring F, so that as the piston rises it exercises a gradually increasing pull upon the valve by the compression of the spring, until the pull is sufficient to overcome the weight of the valve and the pressure on it. Thereupon the valve is first slightly raised, so as to allow the liquid pressure to act on the annular area under the flange of the valve. The downward pressure on the valve being thus to a great extent balanced, the spring raises the valve, drawing it up close to the piston. The part of the valve which enters the opening is of taper form; so that, as it ascends and descends, it effects the gradual opening and closing of the outlet.



As soon as the valve D is opened, the pressure decreases below the piston, which then descends by its own weight. The liquid thus forced out of the cylinder, together with that still entering through the inlet C, passes through the valve opening, and up through the passage H, in which there is a small turbine G. This is caused to rotate by the upwardly-flowing liquid; and the motion is communicated to a counter at the top of the apparatus, so that the quantity of liquid flowing in through the inlet while the valve is open, *plus* the amount discharged from the cylinder by the piston, is measured. The quantity discharged from the lower part of the cylinder passes into the upper part as the piston descends; and the quantity which enters at C passes out directly through E—following immediately after the quantity previously discharged from above the piston during its upstroke, so that there is a continuous flow of liquid from the meter.

As the piston approaches the end of its downstroke, the tapered end of the valve D enters the opening, and gradually restricts the passage until the valve is seated. The liquid entering through C then forces the piston up again; and the operations are repeated.

Treating Ammoniacal Liquor, and Obtaining Useful Products Therefrom.—Bower, H., of Philadelphia, U.S.A. No. 8330; April 26, 1895.

This invention relates to "economically obtaining sulphocyanide and ferrocyanide in separate form available for the manufacture of the various commercial salts."

To the ammoniacal liquor, while cold and before it has been heated or subjected to the action of an acid, the patentee proposes to add metallic iron or a salt of iron, or both, in quantity sufficient to convert the hydrocyanic acid present in any form into ferrocyanide of iron, and the sulphocyanic acid into sulphocyanide of iron. The mixture is then run into a still or treating vessel provided with means for agitating its contents. Excess of lime is added to evolve ammonia; and the latter is distilled off by means of heat and agitation in any of the well-known methods for recovering ammonia. So far the process is similar to that described in patent No. 2918 of 1882.

Having driven off the ammonia, the patentee adds to the liquor, which holds in solution ferrocyanide of calcium and sulphocyanide of calcium, an acidified solution of a salt of copper (preferably cuprous chloride), sufficient to decompose the calcium ferro and sulpho cyanides—a chloride being chosen on account of it forming a soluble salt of calcium, and a cuprous salt being preferred to a cupric salt, because the cuprous sulphocyanide is insoluble. There is thus obtained a precipitate containing ferrocyanide of copper and sulphocyanide of copper mechanically mixed. After separating the precipitate by settling, filtration, or other means, it is treated while wet, and preferably by agitation, with a sufficient quantity of finely-divided metallic iron—as iron filings or borings or "reduced iron"—to decompose the copper salts, converting the ferrocyanide of copper and the sulphocyanide of copper respectively, into ferrocyanide of iron, which is insoluble, and sulphocyanide of iron, which is in solution, and copper, which is in the metallic state.

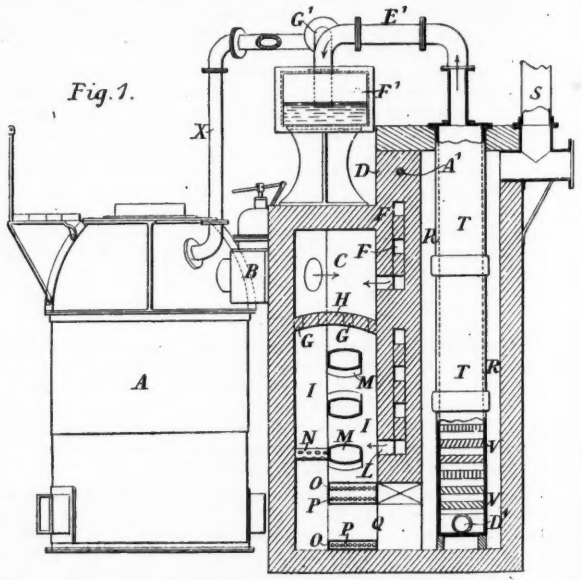
The ferrocyanide of iron, on being treated with an alkali, an alkaline salt, or an alkaline earth, gives as a result the ferrocyanides of the respective salt used; while the solution of sulphocyanide of iron, on being evaporated, yields crystals of sulphocyanide of iron, or this salt may be produced in an impure state by evaporating to dryness out of contact with the air.

Manufacture of Illuminating Water Gas.—Newman, A. R., of Lime Street, E.C., and Somerville, J. M., of Grove Park, S.E. No. 8746; May 2, 1895.

This invention refers to apparatus for gasifying oil and fixing carburetted water gas—permitting of the manufacture of the gas "in small quantities and continuously without waste of oil vapour, and effecting complete combustion of the generator gas and utilization of the heat contained therein."

Two fuel chambers are employed for the production of water gas, and are arranged (as shown), so as to permit of the use of one for the decomposition of steam into the resulting gases, while the other is under blast for raising the fuel to incandescence. In this way a continuous stream of water gas is made available. The waste products of the blast are led through connections B into a combustion chamber C of fire-brick, where they meet and mix with a supply of heated air, which (entering the heated wall D at E) is conducted through the flue F into the chamber C. These mixed gases, being ignited, pass down through nostrils G in the arch H into the retort chamber I, at the bottom of which there is another inlet L for the supply of secondary heated air for the further combustion of waste gas. An oil vaporizing or carburetting retort M, formed of inclined cylinders arranged in zig-zag form, is fixed in the chamber I, and is heated by the passage of the

Fig. 1.



burning gases. A baffle-plate N on the lower arm of the retort has the effect of sending the furnace gases over a steam superheater comprising a casting O, in which several convolutions of steam-pipes P are fixed, in order to raise the temperature of the steam. The gases then pass through the opening G into a fixing retort chamber or furnace R, and thence to the exit-funnel S.

The fixing retort comprises a vertical metal cylinder T of elliptical cross section in three lengths joined together; the interior being built up of a series of gratings V placed one upon the other at a short distance apart, and having bars W arranged at different angles, so that the gases, in passing through the retort, traverse a spiral path in their ascent—causing them to acquire a gyratory motion, prolonging the period of heat-influence upon them, and increasing the heating surface to which they are exposed.

The water gas is led from the producers, through pipes X, into a seal-tank Y; and thence through a pipe Z to the carburetting retort M of metal tubes, arranged as shown. The oil to be converted into gas is

led from a tank through a pipe A^1, which passes through the heated wall D (the oil being thereby raised to boiling-point), and is delivered through an open spout B^1 to the upper part of the zig-zag carburetting retort M; flowing, with the water gas, through it and a connecting-

Fig 2.

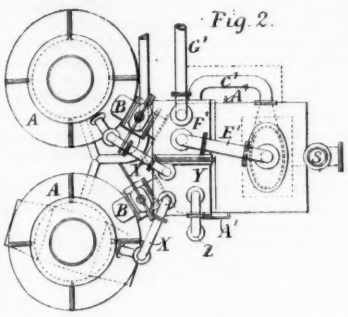
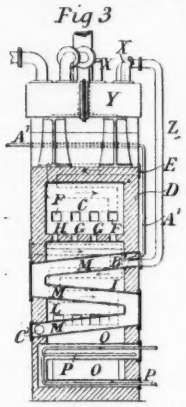


Fig 3



pipe C^1 to the base D^1 of the metal fixing retort. On leaving the fixing retort, the oil gas—rendered permanent by the heat to which it has been subjected, and combined with the water gas—is conveyed through the pipe E^1 into the seal-tank F^1, and from thence, by the pipe G^1, to a gasholder or other storage device.

Automatically Closing Gas and Water Supply Pipes.—Harff, M., of Koln-Ehrenfeld, and Siebert, A., of Niederlahnstein, Germany. No. 16,722; Sept. 6, 1895.

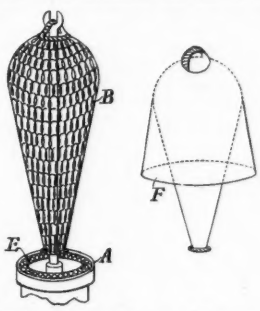
This device for releasing automatically the closing apparatus of gas-burners, as soon as the main-tap is shut, consists of a piston exposed to the action of the flow of gas, so that, when the main-tap is open, the organ for releasing the closing tap is, under the pressure of the gas, kept open; but it moves back as soon as the main-tap is shut sufficiently to release the stop or catch—the effect being to automatically close the tap.

Incandescent Illuminant Appliance.—Burgess, J. F., of Upper Clapton. No. 23,149; Dec. 3, 1895.

This invention relates to the construction of an illuminant appliance in the form of a "core" or "centrepiece" (to be rendered incandescent by gas or other burners) of any material, impregnated with refractory compounds, in any shape or form of a porous nature.

The illustration shows an inverted conical core or centrepiece with a spherical top; also an outline of an inverted conical core or centrepiece with an addition of a vertical ring or flange.

The core B is suspended by a holder, as will be seen; the smaller end being downward, and central with the air-supply tube E, in the centre of the head A. The inverted conical or other shaped core or



centrepiece, can also have a deep flange of the same material of which it is constructed on its uppermost outside edge, as at F—thus forming a vertical ring or flange at the top with a conical projecture, leaving a space between the core and the vertical ring; or it can be combined with a mantle, thus having two lighting walls—the inverted conical or other shaped core or centrepiece inside and a mantle outside. The core or centrepiece with the wide vertical flange or ring would be made in one piece, to be woven just the length of the vertical ring, in excess of the length required for the conical inverted or other shaped core or centrepiece without the vertical ring; then, by simply inverting the extra length at the base of the cone, the core or centrepiece, with its vertical flange or ring, is produced.

Gas-Burners.—Burgess, J. F., of Upper Clapton. No. 23,150; Dec. 3, 1895.

This invention relates to convertible gas-burners—that can be used as argands to burn pure gas, or (by simply opening an air-valve) they can be used as atmospheric burners, to heat any substance to incandescence.

Fig. 1 is a general view of the burner, draught plate, and tubular air-cock complete. Fig. 2 is a sectional elevation of the burner, plate, and cock. Fig. 3 is a sectional elevation of burner at right angles to fig. 2.

The burner (fig. 1) consists of an arrangement of tubes through which pure gas or a mixture of gas and air are conducted, either for a luminous flame or a non-luminous atmospheric flame. A special feature of the burner is its adaptability to heat to incandescence "a substance in the shape of a pear, or various shapes, in the middle space within the annular flame. . . . It can also be used to heat to incandescence at one and the same time a core in the middle space within the annular flame, and a mantle on the exterior of the flame." Fig. 2 consists of the exterior tube A, which slides over the Y or breeches pipe or conveyor B, thus forming a gas chamber S. The bottom of the said tube A is perforated and slotted as shown at C, for the purpose

Fig 1.

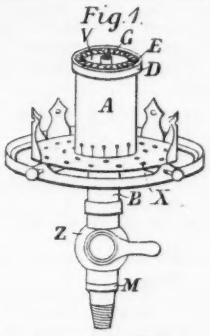
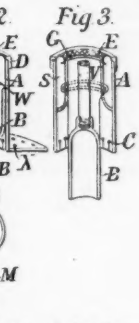


Fig 2.

Fig 3.



of fitting easily and firmly into a hole in the centre of the draught-regulator plate X; also for supplying air in conjunction with the regulating-plate to either an atmospheric or a luminous flame. This tube is fitted with a cap D, to fasten the top platform gauze E on the outside edge; the inside edge being turned round so as to leave a hole to fit the centre stop or air-tube G at the top.

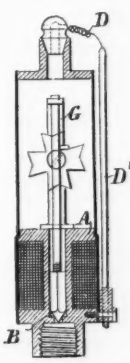
The draught-regulating plate X has special features, as follows: When the chimney is inserted and held in position, its base rests on the top of the plate; thus reducing to a minimum the flow of air through the chimney outside the flame. It now with this draught-regulator plate admits only the correct amount of air as supplied by holes in the plate and that supplied through holes C in the tube A. Thus, by virtue of the heat of the flame, the natural draught for luminous lighting, and also for atmospheric, is nearly all passed up the space V, forming an annular flame for complete combustion on top of the gauze E.

When the valve O is closed, no air can enter the base of the tube B. The gas is supplied by the pin-burner M, and the pure gas then passes up the breeches-piece into the gas chamber S, and is diffused by the wire-gauze distributor W to the wire-gauze platform E, from which the gas issues, forming when ignited an annular flame. The outer tube being open at its base, and the centre stop or air-tube being open at both ends, it leaves a space right through the outer tube by virtue of the centre stop or air-tube being open at both ends. Through the space V, the air ascends into the middle space within the annular flame; and this air, as well as that which is supplied from the outside, serves for the complete combustion of the gas—thus practically destroying the non-luminous portion of the flame by the amount of oxygen passed through the centre of the flame by the regulating-plate.

When the valve O is open, and gas is supplied, the air goes in through the air-inlet holes and mixes with the gas, as both ascend together through the breeches-tube to the chamber S, where it is thoroughly mixed and equally distributed. The gas and air mixture issues and forms when ignited an annular flame; there being the space V, herebefore mentioned, through the outer tube and centre stop or air-tube. Air ascends through this space into the middle space within the annular flame; and this air, as well as that which is supplied from the outside, serves for the complete combustion of the gas by the oxygen passed up the space V into the middle of the flame by virtue of the regulating-plate.

Electrical Gas Lighters and Extinguishers.—Anglo-Swedish Trading Association, Ltd., of Aldersgate Street, E.C., and Wollert, O. E., of Stockholm. No. 24,437; Dec. 20, 1895.

This invention is designed to regulate the opening and closing of the gas-valves of mechanically operated gas lighters and extinguishers; the valve being lifted off its seat by one impulse and kept off, the next impulse lifting it again, and finally dropping it back on to its seat, and so on alternately.



The illustration shows a section of an electrically operated gas lighter and extinguisher; the gas-valve being in its closed position.

A is a bobbin of a solenoid or electro-magnet, having its socket bored to receive a valve, with sides provided with flats or channels to allow the gas to pass it when its conical lower end is lifted off its seat B. The bobbin is wound in the usual way with insulated wire, which forms part of the same circuit that includes the resistance D and the insulated conductors D^1. The circuit, when closed, heats the resistance to incandescence, and, by energizing the solenoid, lifts the valve so as to allow gas to pass to the burner, where it is ignited by the resistance D.

The present improvements consist of a toothed wheel, supported by a bracket G on a pivot or pin, co-operating with two pins or pellets

carried by an extension rod of the valve—this extension rod having a guide formed at the top of the bracket, which prevents it from turning by the lower pellet travelling in a slot formed in the bracket. The toothed wheel is provided with alternate deep and shallow spaces between its teeth; and the teeth have their sides inclined so as to cause the wheel to be partially rotated each time either of the pellets engages the teeth. Each pellet engages the next space to the one it previously engaged, with successive liftings and fallings of the valve.

APPLICATIONS FOR LETTERS PATENT.

5085.—Richardson-Bunbury, M. W., and Dew, F. C., "Mantle protector for incandescent gas-light." March 6.

5091.—Moeller, J., "Clearing incandescent gas-burners from dust." March 6.

5118.—Forester, H. C. B., "Production of consolidated fuel from fine coal or coal dust." March 6.

5150.—Blakeley, J. F., "Automatic acetylene gas-generator." March 7.

5184.—Lewis, G. P., and Cripps, F. S., "Recovering cyanides from waste products in gas, chemical, and iron works." March 7.

5194.—Wheatley, W. H., "Bunsen burners." A communication from C. Schmid. March 7.

5196.—Richards, J. A., "Oil, gas, and like explosive motors." March 7.

5203.—Schwarzschild, A., "Igniting devices for gas-burners." March 7.

5220.—Warner, W. C., "The self-acting indicator for the penny-in-the-slot automatic gas-meter." March 9.

5277.—Donaldson, W., "Gas control of an explosive gas motor." March 9.

5279.—Ragot, G., "Production of acetylene gas and utilization of the same for lighting purposes." March 9.

5291.—Kitson, A., "Manufacture of gas." March 9.

5306.—Graefe, F. A. F., "Prevention of the glow-bodies becoming damaged on cleaning the incandescent gas-light apparatus." March 10.

5336.—Lavender, R., and Tice, W., "Increasing the illuminating power of gas under combustion." March 10.

5368.—Duncan, J. H. H., "Incandescent gas-burners." March 10.

5375.—Turney, E. T., "Generation of gas." March 10.

5606.—Boult, A. J., "Burners for acetylene gas." A communication from E. Rosseau. March 12.

5624.—Farnsworth, E., "Manufacture of gas." March 12.

5645.—Beechey, C. G., "Coin-freed or actuated, or automatic, gas-meters." March 13.

5686.—Hersey, S., and Kirkham, Hulett, and Chandler, Limited, "Washing, scrubbing, and purifying gas." March 13.

5693.—Himmel, G., "Incandescent gas-lamps, more particularly street lamps." March 13.

5714.—Crooke, W. T., and Saunders, C. J., "Gas fires and stoves." March 14.

5723.—Daniel, G. A., "Sand-sealed gas-reversing and other valves." March 14.

5738.—Johnson, E., and Thompson, J., "Gas regenerative furnaces." March 14.

5754.—Harvey, W. H., "Argand gas-burners." March 14.

5768.—Fowler, W. M., "Liquid-meters." March 14.

5813.—Holliday, T., "Production and application of acetylene gas" March 16.

5814.—Lanchester, F. W., "Gas and oil motors." March 16.

5849.—Tyacke, F. H., and Gittins, C. E., "Water softening and purifying apparatus." March 16.

5868.—Rose, A., "Bunsen burners." March 16.

5905.—Webb, G., and Kelly, J. W., "Gas-generator." March 17.

5916.—M'Kinnon, F. A., "Treatment of coke so as to render it suitable for transport." March 17.

5976.—Appleby, E., and Harris, H. F., "Automatically and safely generating and storing acetylene." March 17.

5989.—Ash, T. M., and Weldon, H. N., "Mantles for use in incandescent gas lighting." March 17.

6005.—Wood, J., and Clark, W., "Appliance to be used for making pipe-joints." March 18.

6055.—Bower, G., "Regenerative gas-lamps." March 18.

6067.—Briggs, F. H., "Gas and oil engines or motors, and carriages propelled thereby." March 18.

6103.—Enright, J., "Gas-engines." March 19.

6184.—Redmayne, L., "Hot-water boilers for gas cooking-stoves." March 20.

6212.—Frewin, P. C., "Gas-generators." March 20.

6233.—Doré, G., "Recording and indicating statements of account or charge for commodities supplied by meters." March 20.

6254.—Parlby, W., "Quenching or cooling coke produced in the manufacture of coal gas." March 20.

6270.—Pattinson, J. S., and Fawcett, Preston, and Co., Limited, "Treatment of certain earths for the extraction of the soluble matters therefrom." March 21.

6275.—Pollard, A., "Preventing unsymmetrical coins entering slots of meters." March 21.

6286.—Schwarz, I., "Burners for lamps, lanterns, and the like." March 21.

6324.—Molas, J., "Engines worked by compressed air or other gaseous fluid." March 21.

The London County Council, the Local Authorities, and Constant Supply.—As a result of a conference between representatives of the London County Council and of Vestries and District Boards in the County of London, as to handing over to them certain powers now possessed by the Council, a resolution was passed against the transfer of those for requiring the Water Companies to give a constant supply. This is a decision of importance, as many of the Local Authorities in South and East London have passed resolutions demanding that the Companies shall provide a constant supply.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Bimetallism.

Sir,—It is refreshing to see such complex questions as the appreciation of gold and bimetallism, which have troubled the "expert" mind for so long a time, and perhaps created more conflict of opinion than any other, summarily and easily disposed of in your leading article of the 24th inst.

With all courtesy, however, I venture to think the matter will still remain an open question; and the fact of equally eminent authorities being ranged on either side, while increasing the perplexity of the situation, surely lifts the supporters of bimetallism out of the region of partial insanity to which you appear to consign them.

It would be neither necessary nor desirable to enter here into a discussion of the arguments for or against bimetallism; but its votaries ought certainly to have credit for wishing to introduce, not a "shifting standard of value," as you suggest, but (and this constitutes the chief point of their contention) a firm dual standard of the two metals, so that they may be interchangeable between gold and silver using countries at a fixed ratio.

Whether it is practicable or not, is another matter; but unquestionably the meaning and aim of bimetallism is the correction of the present shifting measurement, and not its extension.

6, *Drapers' Gardens, E.C., March* 27, 1896. H. Reginald Sibson.

The Chesterfield Water and Gas Award.

Sir,—I am surprised at the tone of the remarks in this week's issue of your Journal. I am the holder of 800 shares or more of the 7 per cent. maximum issues, which I bought at premiums running up to over £13 per share. On this stock, dividends—notwithstanding the coal strike—have averaged for the last ten years, 5¼ per cent. If I receive £13 per share, where am I to re-invest the capital to produce anything like that income in any reasonable security? If the Company had not been, to an extent, a success, the Corporation would have let us "stew in our own juice."

I think there should be some rule on which these expropriations are to be paid for—whether on the earnings or on the structural plant. Otherwise it will be dangerous embarking in any such enterprise as water, gas, or railway or canal companies in England. Only the other day, the Board of Trade compelled a canal company in a by-no-means prosperous condition, to revise their tolls, and confiscated a very serious portion of their revenue.

March 26, 1896. A Subscriber to Your Journal.

Cripps's Improvements in Working Gas Purifiers.

Sir,—In your article headed "Improvements in Working Gas Purifiers," the compact and ingenious device of Mr. Cripps for overcoming a difficulty is deservedly spoken of; but you make no mention of another plan, not for meeting, but for preventing the difficulty.

It must be nearer forty than thirty years since the plan was first adopted at the Old Kent Road; and it has been followed with advantage ever since. It consists simply in reversing the current of gas—passing it downwards instead of upwards—through the purifiers. It was in the early days of admitting air into the gas, for the purpose of continuous revivification of the oxide *in situ*, that the necessity for this alteration became apparent. The bottom layers of oxide caked so hard that, long before it was otherwise necessary to change a box, we were compelled to do so by the rise of pressure.

Mr. F. C. Hills devised a method of stirring the oxide, to prevent it caking, by means of revolving arms intended to work horizontally in the bottom layer of oxide, in one of our set of 10 feet square purifiers. These arms were attached to an upright shaft, to be moved by a large spur-wheel and small pinion; the spindle of the latter having a square end projecting through the side of the box. One day our late valued foreman Mr. Moss and I tried to turn the arms; but finding them hard to move, we put our knees on the lever, and down it came—catching my finger rather unpleasantly between the lever and the floor. Perhaps this is why I remember the experiment so well. We had broken something, but had not moved the arms. This failure naturally led us to think of other means of accomplishing our object; and the reversal of the current of gas was the result.

Whether the idea originated with Moss or Hills or myself, I cannot say; but it was then adopted for the purpose of enabling us—when the upper crust of the oxide became caked—to lift the cover and loosen it with a garden fork. This operation, however, was found to be unnecessary, which I attribute to the fact that the caking of the top surface was much less than was that of the under surface when the gas travelled upwards. All purifiers were altered to the new plan.

No secret was made of this alteration; but as it would appear from your article that it has been forgotten, I may state its advantages. Of course, it is obvious that, in the event of the first layer or two becoming inert or foul, they can easily be removed, which is often a great advantage when the sulphur purification goes wrong. There are, however, other advantages. The surface of purifying material with which the gas comes first in contact on each layer is of double the area; and therefore during the whole time that gas is passing, it offers an easier passage than obtains when the first contact is with the compressed and often caked material lying on the sieves. It is also impossible for the gas to make a blow-hole through the purifying material, even if in a very thin layer. By the reduction of pressure or resistance caused by this method of working, however, somewhat thicker layers of material may be used. The plan is an exemplification of the old and too often forgotten adage that "Prevention is better than cure."

March 27, 1896. George Livesey.

SIR,—I see in your last issue drawings of a make of purifier, by which it would be of much greater depth than usual, the quantity of purifying material much increased, and make arrangements to pass the gas beyond the purifying material already saturated, and bring it into contact with fresh material.

This is an old idea of mine, which I thought out twenty years ago—feeling that, with the constant reduction in the price of gas, much consumption of gas would be the result, much increase of space would be required for purifiers, which in many works would be a difficulty. Having some other matters which I wished to secure, I included this in my patent No. 2843, Aug. 12, 1875, a copy of which I here send you—marked at page 8, which refers to this portion of the patent.

I have never pushed it, though I still think it a matter worthy the attention of the gas engineer.

GEORGE ANDERSON.

35A, *Great George Street, S.W.*,
March 24, 1896.

[The particular paragraph of the patent specification referred to in the above letter is as follows: "Improvements in the Construction of Dry Purifiers.—These improvements consist in making them very much deeper than they usually are, putting in a much greater depth of purifying material than is usual, by which three or four times as much gas can be purified in one vessel as has hitherto been the case, and occupying proportionately less ground; also in reducing the size of the hydraulic sealed cover in purifiers of large dimensions, which makes it much easier to lift while giving abundant space for the men to discharge and charge the purifier."—ED. J.G.L.]

A Question as to Charging for Unregistered Gas.

SIR,—When taking the indices for the December quarter last year, it was found that a meter owned by a consumer had only registered 100 cubic feet. This was manifestly wrong; and it was ascertained, upon testing, that the meter passed gas without registering it. The account for the September quarter was made out, in accordance with the indication of the meter, for 500 cubic feet; the consumption in the corresponding quarter being 1400 cubic feet. In making out the account for the December quarter, the charge was based upon the average consumption for the three previous corresponding half years—viz., 5700 cubic feet, less 700 cubic feet; giving the consumer the benefit of his allegation that he had used less gas, and allowing for the 500 cubic feet which had been charged and paid for to the 30th of September. This account, he refused to pay; but he failed to show that the estimate was unreasonable. Accordingly, proceedings were taken for its recovery; and the case came before the Magistrates at the Borough Petty Sessions on Monday last week.* On that day, I was requested to attend the Court, as the consumer intended defending the action. Our collector informed me that the Magistrates' Clerk advised a compromise, as we could not recover, and had no right whatever to claim anything antecedent to the 30th of September, for which a receipt had been given.

On the case being called, our collector, who usually appears in such cases, stated the circumstances, and produced a letter I had sent to the consumer some days previously, showing in writing how the estimate had been arrived at. To this, no reply had been sent. This letter, however, the Court would not consider; and it was stated, both by the Clerk and the presiding Magistrate, that, as the amount was an estimated one, we could not recover. When the defendant volunteered an offer, he was advised that it was more to his advantage to keep quiet. I was sitting near the Chairman, and he turned to me and advised taking the consumer's offer of 18s. (the account was for £1 0s. 3d.). I explained that I considered the account sent was fair and reasonable; and upon being questioned as to whether or not we would accept the 18s., I answered affirmatively, in accordance with the wishes of one of my Directors who, as a sitting Magistrate, had retired when this case came on.

This interpretation of the law, as I understand it, means that, if a meter ceases to register, a gas company can recover nothing legally from any consumer, although it is common knowledge that gas has been used; and, abiding by this decision, we can in future only appeal to a consumer's honour to pay for gas burnt, should a meter cease to register. The Clerk's explanation to the Chairman of this Company was that the remedy lay with the Company in making frequent inspection of meters, to prevent the possibility of such an occurrence as the one I have mentioned.

To summarize: A consumer's meter—his own private property—fails to register; and the Magistrates decide that nothing can be recovered. Is this the law?

B. A. LEWIS, Secretary and Manager.

Carmarthen Gas Company, March 27, 1896.

Bristol Water-Works Company.—The report of the Directors of this Company states that the revenue from water-rates in 1895 was £105,287; being an increase of £3593 upon that of the previous year. The sum shown by the revenue account to be applicable for dividend is £25,652; and the Directors recommend that dividends of 3½ per cent. on the ordinary, and £2 9s. per cent. on the 7 per cent. maximum consolidated ordinary stock, be declared; making, with the interim dividends, 7 per cent. and £4 18s. per cent. respectively for the year, and leaving a balance of £5638 to be carried forward. The increase of revenue is very satisfactory; and particularly as regards the receipts from the sale of water supplied for trade and public purposes. The year's working expenses include the expenditure of £1910 caused by special outlay during the severe frost in February and March of last year. With a view of improving the sanitary conditions of the district, the Directors have reduced the charge for flushing-cisterns fixed in dwelling-houses, of £20 gross value and under, from 10s. to 4s. a year. The capital expended during the year was £67,270. The works in the Yeo Valley have made satisfactory progress.

* The case is noticed in our "Legal Intelligence" to-day.—ED. J.G.L.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress was made with Bills last week:—

Bill read a second time, committed, and reported without amendment: Cupar Water Provisional Order Bill.

Bills reported, with amendments: Malvern Link Bill, Newcastle-upon-Tyne and Gateshead Gas Bill, Padiham Urban District Council Water Bill, Ystradyfodwg Urban District Council Gas and Water Bill.

Bill reported, preamble not proved: Ystrad Gas and Water Bill.

Bills read the third time and passed: Birmingham Corporation Water Bill, British Gaslight Company (Norwich) Bill, Cowes Gas Bill, Cheltenham Gas Bill, Falkirk and District Water Bill.

HOUSE OF COMMONS.

Tuesday, March 24.

THE WATER SUPPLY OF THE METROPOLIS.

To-day six of the Water Transfer Bills promoted last session by the London County Council—viz., the Chelsea, East London, Grand Junction, Kent, New River, and West Middlesex Bills—were down for second reading. On the order for the second reading of the Chelsea Bill,

Mr. J. STUART observed that as all the six Water Transfer Bills of the London County Council, with certain subsequent motions, embodied the same principle, he thought it would be for the convenience of the House that the general discussion should take place on the first of them. The measures of the Council with respect to dealing with the water question of London, which were all before the House, contained the one great principle of purchase by the representative municipal authority—first, by agreement, and, failing that, by compulsory arbitration. The water area of London extended beyond the Council's limits; and in the various Bills it was proposed to give to each outside area connected with the Company concerned certain options. What these were, and the whole position of the measures, would be understood if he referred to the report of the latest important General Committee which sat on this matter—viz., that presided over by the present Home Secretary (Sir Matthew White Ridley) in 1891. This Committee recommended that power should be given to the Council to expend such further sums as might be necessary in investigating the whole question and coming to a conclusion as to the policy which should be adopted. The report also set forth that, if the Council should so resolve, they should have the power to promote a Bill or Bills constituting themselves the responsible Water Authority for London, acting through a Statutory Committee, appointed either wholly by themselves or partly in conjunction with the Corporation of the City. The report pointed out that the Council, if constituted the Water Authority, should be required to purchase the Companies' undertakings by agreement, or, failing that, by arbitration within a fixed period. Lastly, having put upon the purchaser the duty of fulfilling the obligations of the Companies, they had said that, in the event of purchase by this new authority, power should be given to it and to the authorities outside the area to negotiate for the purchase by the outside areas of so much of the works of distribution as was appropriate to the district of such local authority, of the right to the supply of water in bulk, and possibly of some sources of supply which, with other works of distribution, it might be found practical and advantageous to separate from the general scheme. The Bill was an endeavour to embody this in a measure before Parliament. Two features of the Transfer Bills had been specially commented upon. The first was that, by the Council's proposals, failing agreement before a fixed date, the property on that date became vested in the purchasers, and the arbitration as to price proceeded. This had been called taking people's property before it had been paid for; and even taking it without paying for it. But the fact was overlooked that by these Bills the Council became responsible from that moment for the payment of the full dividends hitherto paid until the whole of the purchase money had been settled. Had the arrangement come into force last year, the shareholders of the Water Companies concerned would have been better off than they now were. During the interval, however, they became sure of their income on a better security—vastly better—the whole rateable value of London. But the Council were perfectly willing to modify this arrangement. The second point was as to the arbitration clause. A year ago, when two of the Council's Bills passed their second reading, he gave an undertaking, on behalf of the Council, that they would, in addition to the arbitration clause, give an instruction that everything favourable to the case of the purchasers should be considered by the arbitrator. The whole matter was threshed out at great length before an important representative Committee; and the Council formulated a new arbitration clause which substantially carried out certain directions of the Committee. It was said that arbitration under the Lands Clauses Act would not give the Companies all they wanted, and therefore would not be fair to them. But the Council had the public as well as the Companies to consider. Their interests were not coincident; and it was on the divergence of their interests that the principle of purchase in these Bills was based. Why was the second reading of the Bills opposed? Those who wished to have the water supply in private hands would consistently oppose them. But there was more powerful opposition from the Government, who had introduced a Bill seeking to establish a new Water Authority which would take over all the powers as to water which were now in the hands of the County Council. Let the Council pass their Bills and the Government pass theirs; and the moment this was done the Council would hand over their purchase to the Government. The purchase would be effected at a time when it was eminently essential, if it was to be effected at all, that it should be done. Nay, more, in this matter of purchase he had behind him the unanimous opinion of the Council.

Mr. WHITMORE: The hon. gentleman has no right to say the Council are unanimous.

Mr. STUART said he could, if necessary, quote a resolution of the Council directing its parliamentary representatives to oppose the Bills of the Water Companies, which was passed unanimously.

Mr. WHITMORE said certain members of the Council had over and over again publicly stated that they were opposed to the purchase of the rights of the Companies.

Mr. STUART still claimed that the resolution of the Council was practically unanimous. It was, he said, suggested that an adjournment should be sought, so as to come to some arrangement. But the Council had tried to come to terms with the Government, and were willing to adapt their scheme to theirs. However, as a condition precedent to other considerations, the Council were called upon to accept arbitration under the Lands Clauses Act. This he and those who acted with him absolutely refused to do. Let the House observe what the Council were asked to do—to give away the whole of the ratepayers' case, to give the Companies the whole of their demands without investigation or a Committee to take evidence or hear arguments. The case was simply this: "Accept the Companies' terms or lose your Bills. The Government might say these requirements arose, not so much from any favour on their part to the Companies or the clause, as from the circumstances of complication, which made a general agreement necessary if anything further was to be done. He did not admit that anything could justify the Companies in dictating their own terms. The complications which required this concession were entirely of the Government's creation, and were due to their action to prevent purchase except on terms most exorbitantly unjust in favour of the Companies and against the consumers. The introduction of the Bills had been an immense boon to the Companies. The Council had striven hard to pass their Bills; but they recognized that it was impossible to pass them without the co-operation of the present powerful Government. They were anxious by concessions to purchase this co-operation; but they could not purchase it at the price of giving the Companies compensation which they had no right to claim. The interests of the public and the interests of the Companies were unfortunately not the same; and the Council stood by the public. The Government were about to kill the Bills of the Council, and thereby to postpone purchase in a grave crisis in the whole question of the London Water Supply. If purchase was to take place, it must be done quickly. When the Bills of the Council were thrown out, the House would come to the Bills promoted by the Companies themselves; and these Bills the Government were going to pass. They were a confession that the Companies had come to the end of their resources—that they were no longer able to fulfil their obligations. They proposed in these Bills to increase their present nominal capital of £17,000,000 by £3,800,000, or by 22 per cent., and to alter their entire status in a way that would allow them to keep from Parliament for a long time to come. Purchase was to be relegated by the Government to a body whose very existence was still doubtful. This would enable the Companies to hold the field. The concessions they were bound to obtain in such circumstances would rehabilitate them, and give them a new status; while the water consumers would be left naked and unarmed. But, though the Government might kill the Bills of the Council, they would not get rid of the Council's policy. On the contrary, he believed that in the end the Government would have to come round to what the Council proposed; but this would only be after a long delay which would inflict upon the people of London a grievous burden and an irreparable wrong.

Sir F. DIXON-HARTLAND moved that the Bill be read a second time that day six months. He said he did so on two grounds. In the first place, owing to the recent action of the Government, the Bill was not only unnecessary but mischievous; and secondly, even if that obstacle did not exist, the Bill was of a nature that the House ought not to accept. He did not exactly understand whom the hon. member for the Hoxton Division (Mr. Stuart) represented in the matter, because he found that in October last the Parliamentary Committee of the London County Council reported in favour of an application to the Government to introduce legislation on the subject; and an amendment to the report, that the Bills to take over the eight Water Companies should be proceeded with, was, after a long discussion, negatived on a division at a full meeting of the Council. It seemed to him, therefore, that the hon. gentleman represented only himself, and not the Council. The Bills before the House proposed that the Water Companies were to be taken over on a specific date, and without any payment. The hon. member contended that it was an advantage to the shareholders that they should have their property taken over without any payment being made; for he said the shareholders would be secured in their income. The shareholders felt that their income would be more secure in the hands of the Companies than in those of the Council. He also said it was proposed by the Council to constitute a Water Authority, which was to purchase the waterworks from the Companies by agreement, or, failing that, by arbitration. Arbitration was perhaps the one feature of the scheme that was most objectionable. It was not arbitration at all; it was confiscation. The shareholders in the Tramway Companies had to sell their undertakings at the price of old iron; and the stockholders and shareholders in the Water Companies were not prepared to yield their 40 millions' worth of property to be dealt with in a similar manner. The hon. member had offered concessions with regard to arbitration. But he was not the majority of the Council; and what he promised might be repudiated. All the Companies might be dealt with in one Bill; but eight were introduced in order that the first one might be used as a lever in the other cases. There was no doubt that a General Act would be passed—he did not say exactly on the lines of that introduced by Lord James in the other House, because he objected to the Council's receiving a predominant share in the proposed Water Trust; but a Bill giving powers to take over all the Companies. It would therefore be a waste of time and money for them to send these Bills to a Select Committee.

Mr. TRITTON said he had no interest in any Water Company, or in any company or concern which had; nor was he an opponent of the London County Council as a whole. Indeed, he had great sympathy with that body, which was already overworked; and for that reason he was opposed to giving them any fresh work to do. He objected to the Bill rather on account of the quarter whence it proceeded—the Progressive Party on the Council. That party had completely lost the confidence of the people of London. He fully desired that the water supply of London should be taken out of the hands of the Companies and vested in some public authority; but he did not think the County Council was the authority possessing the necessary qualifications. That body had no jurisdiction over the entire area to be supplied; and the people in the area outside the Council's jurisdiction ought to have some voice in the matter. The House ought to wait for the Government proposals before taking any further steps in this matter. It was, therefore, he thought, best to leave these Bills in a state of suspended animation till the Government scheme was before them.

Mr. PICKERSGILL said he believed the County Council adequately expressed the general feeling of London when it stated its willingness to make some concession in regard to the constitution of the governing body, provided they had an opportunity of submitting to a Parliamentary Committee a reasonable basis for the acquisition of the Companies' property. If the Companies were not afraid of an adverse decision, why were they unwilling to go before that impartial tribunal, and why were the Government supporting them in that position?

Mr. CHAPLIN said it would be convenient if he were to state at once the course which the Government proposed to take with regard to the fourteen Water Bills on the paper, and the view which the Government held as to the future supply of water to the Metropolis and the surrounding districts. In the first place, there were five Bills promoted by various Water Companies for the purpose of increasing the supplies they at present possessed. Then there was a Bill presented by certain local authorities in Kent for the purpose of setting up a new and altogether separate water undertaking. Thirdly, there were the Bills of the County Council, whose object was the acquisition of the entire property of the eight Water Companies at present supplying London and the surrounding districts. With regard to the Bills in the first class, the course of the Government was clear. They would do nothing whatever to interfere with the progress of any measure required for the purpose of increasing the water supply needed in the interest of the public. Parliament had had some warning on this point already. In the summer of 1895, there was a sudden breakdown in the water supply in one of the poorest districts served by the East London Water Company; and for a considerable period the service was limited to three hours a day. What were the privations and hardships inflicted by this failure on the poor people in that part of London, the House would understand when he stated that it was a district in which anything in the nature of adequate means of storage was the rarest possible exception rather than the rule. He had some opportunity of examining into the question on the spot; and in his opinion there were several days when the position threatened to become critical in the extreme. The difficulties were happily averted by a sudden change in the weather and by copious rains. He should express the opinion of gentlemen in all parts of the House in declaring that it was intolerable that such a state of things should be even possible in London to-day. At that time he was pressed in many quarters—and he should have taken the same course without being pressed—to institute an inquiry, under the powers of the Local Government Board, into the causes of this failure. An inquiry was conducted by two gentlemen (Colonel Ducat and Dr. Barry) with the greatest ability and impartiality; and he was glad to acknowledge publicly the services they had rendered. Although he did not for a moment wish to rake up past controversies on this subject, he must say that the report of these gentlemen made it absolutely clear that the failure of the water supply was in no way whatever due to failings on the part of the East London Water Company. On the contrary, the evidence showed that the Company had been anxious for a long time on the question of whether or not they had sufficient storage powers. They had made all their preparations to increase the storage; and in 1892 they came to Parliament with a Bill for the purpose. But what happened to that Bill? "That Bill," the Commissioners said, "was thrown out by Parliament on the second reading. A large amount of evidence was brought forward to show the action of the London County Council with regard to this Bill, both in 1893 and 1894." And they went on to say that "if it was afterwards refused to send this Bill to a Committee, the responsibility for the want of storage in 1895 cannot justly be saddled in any way upon the Water Companies." With that warning before them, Her Majesty's Government were not prepared to take upon themselves the responsibility of any action whatsoever which might, by any possibility, lead to a recurrence of similar mischiefs in future; and accordingly, as far as they were concerned, they proposed to allow the Companies' Bills to go forward and to pass the second reading, subject, however, to the instruction which it would be his duty to ask the House to agree to later on, the effect of which would be to limit the operation of the Bills to works required for an increase in the supply which was needed in the public interest, and which at the same time would prevent undertakings which were unnecessary, and might be calculated to forestall or prejudice any future arrangement which might turn out to be either possible or desirable in connection with the proposals Her Majesty's Government had submitted already in the other House. The Transfer Bills of the County Council, and the Bill promoted by Kent to create a separate Water Authority in that district, stood on a totally different footing; for they came directly into conflict with the proposals made in the other House, as he would show in a moment by explaining the policy of the Government. In doing so, it would be sufficient to say that all authorities, and all Committees to whom the question had been entrusted, were practically agreed that the water supply for the Metropolis and the surrounding districts ought either to be in the hands or under the effective control of some public body which would represent the interests and command the confidence of the water consumers. On this subject the recommendation of the Committee of 1880, which was presided over by the right hon. gentleman the leader of the Opposition (Sir William Harcourt) was as follows: "That it is expedient that the supply of water to the Metropolis should be placed under the control of some public body which shall represent the interests and command the confidence of the water consumers." And then with regard to the duties to be entrusted to that body, they proceeded——

Sir W. HARCOURT: Read the sentence which precedes that.

Mr. CHAPLIN: I will leave that to the right hon. gentleman.

Sir W. HARCOURT: No, no. To leave out the preceding words would be a misrepresentation of the report. The sentence begins in this way: "In the absence of any single municipal body."

Mr. CHAPLIN: I am perfectly ready to read it, if the right hon. gentleman thinks it necessary; but I omitted it, for the reason that there is no municipal body of which I am aware which is representative of the district.

Sir W. HARCOURT: Why omit the sentence?

Mr. CHAPLIN: Because it did not appear to me *ad rem;* but as the right hon. gentleman desires it, I shall have the greatest possible pleasure in reading it: "That, in the absence of any single municipal body to which these functions should be committed, a Water Authority of a representative character should be constituted; and that a Bill having that object be introduced at an early date by Her Majesty's Government." This, he continued, was precisely the Bill which Her Majesty's Government had introduced—a Bill to create a representative body. It would be impossible, he thought, to devise a scheme more in accordance with the recommendations of the Committee than the Bill. The object and the general effect of the policy of the Government with regard to the question might be described almost in a sentence. They sought to bring into existence a body which should be thoroughly representative of all the interests comprised within the district; they proposed to leave to that body, when brought into existence, the entire decision as to what their policy should be in the future; and they intended them to have the amplest powers to give effect to that decision, subject, of course, to the sanction of Parliament. This was a reasonable, intelligent, and perfectly straightforward policy for the purpose of dealing with the question. That being so, it must be obvious to the House that the Kent Bill and the Transfer Bills were directly in conflict with the policy of the Government. The first of the Bills set up in one part of the area a counter-authority to that which was contemplated by the Government; and the other Bills—namely, the County Council's Transfer Bills—had for their aim the immediate acquisition of the property of the Water Companies by an authority which would leave one-fifth of the rateable value and one-fifth of the population unrepresented altogether, and which would in no way be representative at all of 500 square miles out of the 621 square miles comprised in their district. Under these circumstances, the Government had no alternative but to oppose the second reading of the Council's Bills. Turning to the objection urged to this course—that it would be a mistake on the part of the Government to interfere with negotiations with regard to purchase which had come so near a happy conclusion—he observed that he was extremely doubtful as to the accuracy of this statement. There were in the House numerous representatives of the different Companies, and they would be able to give testimony on the subject for themselves. But, unless he was entirely misinformed, these negotiations were very far from having arrived at anything like a settlement. The Government believed their action, so far from retarding, was much more likely to accelerate a final settlement of the question. In a memorandum which had been circulated by the County Council, they pointed out the great strength of the opposition which they had always had to encounter; and, like their predecessors the Metropolitan Board of Works, the Council "recognized the impossibility of successfully meeting the vast power and influence of the eight London Water Companies, acting in combination, otherwise than by co-operation with the Corporation of the City of London." The Government recognized this; and the Council were also aware that the Government, during the years which had elapsed since the creation of the Council in 1888, had not been successful in making very great progress with this question. Being anxious to aid in the solution, they proposed to put the Council in co-operation, not only with the Corporation of London, but with all the outside authorities also; thereby creating a body which would be infinitely more powerful in conducting and completing negotiations in future than the Council had been in the past. The House must also remember that, subject to the sanction of Parliament, purchase was not the only new power to be conferred on the proposed authority. The acquisition of more effective control over the administration of the Companies, or, if need be, of seeking for, and acquiring, further sources of supply, would be equally within their powers, which had been intentionally made by the Government as wide as they could be. It must be for the new body to decide entirely as to what their policy should be. But many persons thought—an opinion with which he himself agreed—that the obtaining of more effective control over the administration of the Companies, while still leaving to them the duty of providing supplies, might possibly, in the long run, turn out to be the best, most economical, and perhaps most satisfactory mode of dealing with the question. The responsibility of acquiring properties which would impose a burden that was variously estimated at any sum between £30,000,000 and £40,000,000 of the ratepayers' money was very great indeed; and he did not think the other alternative ought to be put on one side altogether. It was stated that the outside authorities interested would be very reluctant indeed to join in any combination such as that proposed by the Government; as they would be afraid of being brought into a body which might possibly entail upon them very large and unnecessary expenditure in the future. He had been told also that they would prefer an autonomous existence; and that they were perfectly capable of taking care of themselves. He did not doubt it. There was absolutely nothing in the proposals of the Government to prevent arrangements of this kind from being made and carried out in the future. On the contrary, the outside authorities, being strongly represented on the new body, would be in a far better position than they were at present to come to any desirable arrangements. The Government had already inserted provisions in the Bill specially designed to facilitate this object; and those provisions could be easily strengthened if there should be any necessity for it. Certain communications had passed between the hon. member for Shoreditch, representing the County Council, and the Government. The object was to consider whether any arrangements were possible by which the Council's Transfer Bills and the Government measure might proceed more or less together. He acknowledged the appreciation which the hon. member had expressed of his readiness to consider proposals of this kind; and he assured him that it was reciprocated. The difficulties of arriving at an arrangement were immense; and he demurred to the interpretation which the hon. member placed upon the particular cause of difficulty which terminated the negotiations. The possibility of any arrangement being made depended entirely on the speedy passage of the Government Bill. A Committee could hardly conduct their deliberations with reference to a hypothetical body. But to ensure the speedy passage of the Government measure, it was, of course, in the first place, necessary to disarm all opposition. He soon discovered that, to do this, it was necessary for the Council to abandon the arbitration clauses which were at present in the Bill, and to rely on the ordinary law. To allow their Bills to proceed, therefore, would simply entail enormous cost and trouble on a variety of interests which would be affected, without any corresponding advantage to anyone. The Government would make every effort to pass the measure they had introduced. While greatly regretting the necessity which brought him at so early a date into conflict with the great representative authority of the Metropolis, he felt that he had no alternative but to oppose the second reading of their Bills.

Sir W. HARCOURT: A good many years ago I was called upon to take an active part in the consideration of this question; and I think I ought to say a few words on the position it occupies to-day. It was so long ago that the right hon. gentleman might well have forgotten—if, indeed, he ever read—the report of 1880. I should suppose that he had not read the report, because I ventured to point out that he omitted to read the most important paragraph in it. I had the advantage of a most distinguished *collaborateur* in that report in the Secretary for the Colonies; and I think we may call it a joint report. Now, the great want at that time was some central municipal body which should be entrusted with business of this character, of which Birmingham is a great example. There being no such municipal body at that time, we said in our report that, in the absence of any single municipal body to which those functions could be committed, a Water Authority of a representative character should be constituted. But, of course, if there had been a single municipal body, we should not have constituted another; and therefore the passage to which the right hon. gentleman referred was really an inferior alternative, to which we had recourse in the absence of a single municipal body. That was at the beginning of the Government of 1880. They had in their minds that they should endeavour to carry out a Bill to constitute a single municipal body in London in a London Government Bill. I was responsible for that at the time; and, having that in view, we looked to the constitution of a single municipal body in London. But we were not fortunate enough to constitute that single municipal body, though when our successors, the Conservative Government, came into power, they did constitute it. They left outstanding the Corporation of the City of London; but when the Committee of 1891, presided over by the present Home Secretary, sat, reference was made to the Committee of 1880, and to the declaration that, when a municipal body was formed in London, they would be the proper people to be the Water Authority. Therefore, the Home Secretary put upon the report of 1880 exactly the interpretation that I did, in contrast to the interpretation of the President of the Local Government Board (Mr. Chaplin). The argument used just now by the right hon. gentleman is this: That is not the single municipal body which was intended by the report of 1880. Then the right hon. gentleman is at issue with his colleague the Home Secretary. I will read the words: "Your Committee therefore considers that it would be most desirable that the problem should be carefully and deliberately examined by this newly-constituted municipal authority"—viz., the London County Council. The interpretation of the Committee, then, was that the Council should look after the interests of the water consumers in the Metropolis. In the view, also, of the Committee of 1891, the municipal authority that ought to be charged with these functions was the Council. They said: "Powers should be granted to the County Council to expend such further sums as may be reasonably necessary in order that they may examine thoroughly for themselves, as the responsible Municipal Authority of London, the whole question of the Metropolitan Water Supply, and may come to a conclusion as to the policy which, for financial and other reasons, it is desirable to adopt." The Committee also said that, if the Council should resolve to act, "they should have power to promote a Bill or Bills in Parliament for the purpose of constituting themselves the responsible Water Authority of London, acting through a Statutory Committee." Well, one such Bill is now under the consideration of the House, in accordance with the report of the Committee. They went on: "The London County Council, if constituted the authority, should be required to purchase, either alone or in conjunction with such authorities of outside areas as may be arranged, the undertakings of the eight Water Companies." Nothing could be more distinct. The Government, we are told, have introduced a Bill dealing with the subject of the water supply; but the Bill does not constitute the London County Council the Water Authority. I entirely concur in the expression of the right hon. gentleman who has spoken, that the Water Companies have a great many representatives in this House. Everyone who has had to deal with the water question is perfectly well aware of the extent and weight of their influence in the House; and it is not an influence which is exercised always in the direction of the interests of the consumer. But is it not in the interests of the consumer that the matter should be placed in the hands of some public body which has the interests of the consumer at heart? Lord Knutsford, as representing the Water Companies in the other House, said he was grateful to the Government for having stepped in and put an end to the designs of the London County Council—this "responsible municipal authority" which the Committee recommended should look after the water supply in the interests of the consumer. What are these designs? As I understand the nature of the Bill, they are to acquire the property of the Water Companies, and administer it for the benefit of the public; and Lord Knutsford spoke of the Government as having stepped in to put an end to these designs of the Council. The Government propose to constitute a body in which the Council will have an influence which will not be at all in proportion to the size of the population they represent. The right hon. gentleman has said correctly that the allegation against the policy of the Government is

that it will postpone indefinitely any real reform. If they had introduced a Bill for constituting an authority which should have power to deal at once with this question, we could have discussed the subject on a proper basis. We should have seen whether the body to whom the power of purchase was to be given was a better body to exercise such power than the Council. As far as I understand (and the right hon. gentleman does not deny it) the outside bodies affected by the Bill of the Government do not want this scheme at all—they are not willing partners in the concern; and so you are going to set up a body with a number of persons on it who do not wish to be there. The right hon. gentleman says that they may make arrangements to get away from it. But surely a scheme cannot be very workable that provides for putting upon a body a dozen gentlemen who want to get away from it. Does the hon. member for the Uxbridge Division, who represents the Water Companies, agree with that?

Sir F. Dixon-Hartland: I have nothing to do with the Water Companies in any form. I have not a single share in their property.

Sir W. Harcourt: Then I must condole with the hon. baronet, because I am informed that their shares are very substantial possessions. What I want to know is this: What is the probability, if these Bills are thrown out, that anything practical will be done in reasonable time? If the Bills were passed, something practical could be done. The supplies of water for London would be acquired through the County Council. I am glad to see here the creator of the Council. Whatever hon. gentlemen behind him may think of that body, he, at any rate, has never disowned his offspring; and he has expressed perfect confidence that the Council, if entrusted with the water supply of the Metropolis, would perform its task ably. But a large number of hon. members opposite seem to think it is a sacred duty to attack the Council. I really do not know why this is so. The hon. member for Norwood openly avowed that he attacked the proposals made in these Bills on account of the Progressive quarter from which they came. Is that a reasonable way of treating such a question as the water supply of London?

Mr. Tritton: I said I admired the County Council on the whole; and I have never uttered a word against it.

Sir W. Harcourt: The hon. member certainly said that one of his reasons for objecting to these Bills was on account of the quarter from which they came.

Mr. Tritton: Yes; because, as I maintain, the Progressives on the Council do not represent the bulk of the population of the Metropolis.

Sir W. Harcourt: Well, the question is, How are we going to improve the administration of the water supply? I do not think that improvement will be facilitated by the rejection of these Bills or the constitution of a Water Trust which can do no possible good. The Bill of the Government is a measure that cannot work without the aid of further Bills. Looking at the whole history of this question, I regret extremely that the Government should have made up their minds to throw out, so far as I know, the only practical proposal for putting into the hands of a public body the water supply of the Metropolis. If you think there should be added to the County Council any other representatives, that might be considered; but there is nothing to prevent you taking over the agreements that have been made, or may be made, under these Bills, and consequently getting to work upon this matter at once. With reference to the arbitration clause, it could be altered by the Committee if it appeared to be unjust; and all I will say about it is that it is, practically speaking, the recommendation of another Committee. If it is not, it is intended to be so, and can be made so. I understand the Government have put their foot down against any variation of the arbitration clause, and have insisted upon taking the Lands Clauses Act absolutely. That is the position the Government take; and it is one directly in conflict with the recommendation of the Committee over which Mr. Plunket [Lord Rathmore] presided. They are, therefore, in these two matters in conflict with two Committees—the one over which the Home Secretary presided in 1891, and the one over which the right hon. gentleman whose absence from this House we all deplore—Mr. Plunket—presided last year. It is a strong thing to ask us, in conflict with such authorities, either to throw out these Bills, because they would give an authority to the London County Council, as recommended by the Home Secretary, or because they contain a deviation from the arbitration clause which was recommended in principle by Mr. Plunket's Committee. That is the reason why I regret that the Government are determined to take the responsibility—and I think it is a very great responsibility—of throwing out these Bills. For my part, I shall vote for their second reading, believing they are founded on sound principles, however much their details may be varied, and are likely in the future to give a better system of water supply to this great Metropolis.

Mr. Joseph Chamberlain: The present House of Commons is in possession of the whole of this question of the water supply of London; and I do not think they are likely to allow their decision to be entirely controlled by the reports of Committees which sat in 1880 and 1891, especially if these reports, as I shall show, are in themselves inconsistent. The right hon. gentleman who has just sat down claims me as being jointly responsible with him for the report of 1880; and it is quite true—in the sense that I was a member of that Committee, and voted for the report—that I had a certain responsibility. But he does me altogether too much honour when he says, in effect, that I was his joint *collaborateur* in the preparation of the report. I should not have alluded to this matter—I should have thought it hardly worthy the attention of the House—if the right hon. gentleman had not been constrained to make this direct appeal to me. His memory, I am sorry to say, is short in reference to the whole subject. I beg to call to his mind a memorandum I prepared at his request (which he has, no doubt, among his papers now), in which I advised him to take a totally different course from that which, in his greater wisdom and entire discretion, he ultimately took. I am not complaining of the right hon. gentleman for rejecting my advice; but I do think it is rather strong, after having rejected my advice, to claim me as a supporter and joint *collaborateur* of the report which was ultimately adopted in entire antagonism with that advice. What happened in 1880? The members of the then Government believed, I think with reason, that the terms which had been arranged by Sir Richard Cross (now Lord Cross) with the Water Companies were exorbitant terms; and accordingly we persuaded the majority of the Committee to that effect, and destroyed Lord Cross's Bill. My advice to the right hon. gentleman was to put something in place of it—not to be destructive merely, but constructive also; and I very much regret, and I think London has to regret, that he did not take my advice. Because what is the fact? That for the 16 years since that day, not one step has been taken in advance in the purchase of the Water Companies; and now the price you will have to pay, under any fair arbitration, will be some millions more even than the exorbitant price which, as we thought, Lord Cross was prepared prematurely to offer. I say, then, I cannot claim any special responsibility for the report to which the right hon. gentleman referred; but I think I can claim an equal right with himself to interpret it. I think I know what the report meant, even though I may not have been so enthusiastic an admirer as the right hon. gentleman, its author. The report meant this—that in dealing with the subject a representative authority should be constituted; and by a representative authority we said and meant representative of the water consumers—we meant and said not merely the water consumers of London, but the water consumers of the whole surrounding districts. It is perfectly absurd, and an entire inaccuracy of the right hon. gentleman, to contend we had in view then, if there had been a single municipality in London, the entrusting to that single municipality in London the interest of the water consumers. We never meant or said anything of the kind, but exactly the reverse, as I find in looking up a letter. I find a motion was made on an amendment to the report of the right hon. gentleman by Mr. Sclater-Booth, who proposed to strike out the words "together with the representatives of the outside districts." This was supported by the late Mr. Firth, who was an advocate of a single municipality for London; but the whole of the members of the Government present opposed the amendment, and adhered to the original proposal of the report, which was that the matter should be dealt with by a Trust which represented the water consumers outside London as well as in. That is exactly what the Government's present Bill is; and under these circumstances it is somewhat strange that the right hon. gentleman should get up now, 16 years later, and repudiate the imitation which ought to be the sincerest form of flattery which the Government have made of his own proposal. It it is quite true that in 1891 a proposal somewhat different was made. But I think the House is in possession of the whole facts, and may decide the question upon its merits; and I would put this specially before the London County Council and others who take a great interest in the matter. As a result of my experience, I was convinced you could not adopt a more unwise course than to seek to keep the whole of this business of the water supply of the Metropolitan area in the hands of the London County Council without representatives of the local authorities outside. I have had a good deal of experience in this matter. I was chiefly instrumental in purchasing the Water Companies and Gas Companies of Birmingham. In both cases we had to deal with outside districts; and we made the mistake of not sufficiently taking into account—I will not call it the interests, because we thought we could be answerable for the interests of the districts—but the sentiments of the outside localities. The result was, in the case of the gas purchase especially, that we were put to an enormous expenditure because of the opposition to the Bill which we brought forward; and, further, we had to give to them powers of separate administration and purchase, the effect of which was undoubtedly the multiplication of comparatively small gas-producing authorities, with the result that the proceeding was not as economical as it might have been. If we had constituted, as we ought to have done, a Gas Trust, giving a fair representation to outside bodies, all this would have been avoided, and large sums of money saved. Therefore, I say, in my opinion, at any rate, it is to the interest of all parties concerned that outsiders should feel themselves to be fully represented in the Water Trust; and their interest will then be exactly the same as that of the Metropolitan authority. I do not believe that it would be found that they would be a hostile element, or a source of any kind of conflict; and, on the other hand, I am quite convinced there would be very much less friction. The right hon. gentleman expresses his regret that a greater advance has not been made; and that these Bills, which promised some approach to a settlement, are being rejected, and the Government Bill substituted. I regret it very much, because I believe it is really an unnecessary result. There are practically what I call three contentious interests in this matter—the interest that is represented by the London County Council, the interest represented by the outside authorities, and the interest represented by the Water Companies. As regards the London County Council, I am not one of those who have ever attacked the London County Council as a great representative municipal authority. On the contrary, I have the greatest sympathy with their work. I do not suppose they are more infallible than other municipal authorities; and I have blamed them when they have been wrong. But I have never, either in this House or anywhere else, made anything like a general condemnation of their proceedings. In this matter, so far as the main principle goes, I am entirely in agreement. I do believe that, after the fullest inquiry, you will always come back to this—that the water supply of a great city ought to be in the hands of a representative authority. I admit there is something to be said for the greater control which might be given without actually purchasing. But if you can make the purchase on a fair basis, it is desirable in the interest of everybody that what is absolutely a necessary of life—what is one of the most important adjuncts to the sanitary condition of a great population—should be under the control of the representatives of the people. Therefore, I agree with the County Council in what I believe to be their main object; and I agree with them also that it would be a most regrettable thing if now (when we are, as you may say, on the eve of a settlement once more) the whole matter should be thrown open—that it should be left to a new body to commence, probably at some length, altogether new inquiries, and having come to precisely the same conclusion, then to find they must again go through all the stages which have been partially accomplished already by the County Council. I think that this would be very regrettable; and if this is the result of our proceedings, very considerable responsibility must lie upon those who have brought it about. It is because of this feeling that my right hon. friend has gone to the extreme limit of making offers to all the interests concerned, for the purpose of bringing about

a general agreement. I must say (though I do not want to speak in a controversial spirit) that, in my opinion, the whole fault lies with the London County Council or those who represent it. As regards outside authorities, I have already spoken. I believe their interest is satisfied when they are fairly and fully represented, as they have been in the Government Bill. It is quite true that these outside authorities have been over-represented, if you have regard simply to population and rateable value. But that is a necessity, because they could not be restricted absolutely to representation in proportion only to their present population and rateable value. It is necessary to consider whether they are distinct and separate interests; and I believe these interests are sufficiently safeguarded by the representation proposed in the Government Bill. The Water Companies have never been obstructive in this country. They have always said: "You have not approached us as persons anxious to make a fair commercial arrangement, but as persons desirous of confiscating our property." The Water Companies have always said: "We admit that the public interest is supreme; and, provided that private rights are respected in the same sense in which they have always been in the transactions of the House, and that those for whom we are trustees will be fairly treated in any purchase arrangements, we are prepared to dispose of our property." There are the three contentious interests; and I maintain that they can all be conciliated. The Water Companies are conciliated if you give them the same arbitration clause that has been given in every other case in which a water company has been purchased by a municipal corporation. The hon. member for Bethnal Green said that, under this arrangement, municipal corporations had paid exorbitant prices. I do not know to what corporations the hon. member refers. It is not true of Birmingham. There we had the arbitration clause asked for by the London Water Companies; and, though we did not find it necessary to put the clause into effect, because we made a private agreement, we never contended that the clause imposed on the ratepayers any exorbitant price. And, so far as my knowledge of similar undertakings goes, there is no case in which more than a fair price has been paid. I ask the hon. member for Shoreditch, and others representing the London County Council, whether they contend that it is their duty, representing the ratepayers, to get hold of this property at a price less than its fair value. That is not the duty of any representative body; and, that being so, they should be content to give the Water Companies what they ask. If the terms on which the undertakings shall be purchased are to be settled by arbitration—which I hope will not be resorted to, because I should advise the parties to come to an amicable arrangement—they should have the same price that other companies in similar circumstances have had. I say that, even at the eleventh hour, I believe an agreement might be come to if the London County Council would frankly agree that the Government Bill should go on (and without opposition), on the understanding that the ordinary arbitration clause should be put in, and with the understanding, at the last stage, that the new Water Trust shall be substituted for the London County Council. In that event, the position of the County Council would be that they would have—as they would be justified in claiming, having regard to the superiority of their representation as regards numbers and rateable value—a majority on the Water Trust. But I do not believe there would be, once this Water Trust were established, any sharp line drawn between the representatives of the Metropolitan and the outside area. The interests are not conflicting; and I do not believe there would be any party or any permanent dividing line. The County Council would be fully and fairly represented. They have asked that this body should be a Statutory Committee of the Council. That would give the County Council an absolutely overbearing voice and vote on every proceeding of the Water Trust. We might as well, under those circumstances, hand the matter over to the County Council at once. It is an absurdity to ask local authorities from outside to discuss the matter, and then find the decision arrived at by the Committee, which has heard the whole proceeding, is to be opposed by the majority of the London County Council. It is not reasonable. The conclusion rests entirely with those who represent the County Council; they are blocking the way to a settlement. If they say: "We will not have a settlement unless you enable us to extort terms which have never been asked for in any previous case by a municipal authority," or say: "We will not deal with this matter unless you make us absolute masters of the conclusions at which the Water Trust or authority will arrive"—then they are asking terms so exorbitant and unreasonable that they could not be conceded by the Government or the other interests concerned. But, if they were willing to accept the arrangement offered by my right hon. friend, we might, even now, maintain their Bills, and by the end of the session the new Water Trust would be constituted, with full power to carry out an amicable arrangement with the Companies, or go to arbitration.

Mr. SYDNEY BUXTON thought the speech of the Colonial Secretary would do much towards a settlement of this matter. With reference to the conditions in regard to the Government Bill that the right hon. gentleman had laid down, no one would give a pledge not to criticize the Bill if it was objected to in principle.

Mr. CHAMBERLAIN said any arrangement would involve previous acceptance of the principles of the Bill; but it would not bar criticism of detail.

Mr. BUXTON said that he had not yet studied the text of the Bill; and until he had done so, he could not undertake to accept its principle, which, to many of them, was not based on proper municipal authority. The second condition laid down by the right hon. gentleman was one on which he did not see why, if there really was a desire for concession on both sides, some agreement might not be come to. The right hon. gentleman forgot that clause 6 of the Bill of last year had been withdrawn by the London County Council; and they proposed instead of it to introduce an arbitration clause, founded on the report of the Plunket Committee, and which, in their opinion, carried out the proposals of the Committee. On behalf of the County Council, the hon. member for Shoreditch undertook to accept a new arbitration clause based on the recommendations of the Committee, which would give the Arbitrator the fullest power to consider all circumstances bearing on the value of the undertakings. But the promoters could not commit themselves not to offer any opposition to the Bill of the Government. He hoped the present discussion would bring them nearer to what they all desired, which was the purchase of the undertakings, at a fair price, by a municipal authority, whatever it might be.

Mr. W. F. SMITH said that Unionist members had heard, with satisfaction, the speech of the President of the Local Government Board. The proposal of a Trust by the Government had entirely changed the position; and therefore they could not favour the Transfer Bills brought in on the other side. He urged upon the Government to press forward their own Bill.

Sir JOHN LUBBOCK said that a majority, not only of London members, but of members representing areas outside the Metropolis, opposed the Transfer Bills, because they believed the effect of them would be to increase the cost of water outside the Metropolis. In the London County Council itself, opinions were almost equally divided.

Mr. THORNTON said that the Wandsworth District Board—representing Putney, Streatham, Wandsworth, Clapham, and Battersea—had petitioned against the Transfer Bills.

The House then divided on the second reading of the Bill.

For	125
Against	287
Majority against the second reading	—162

The motions for the second reading of the East London, Grand Junction, Kent, New River, and West Middlesex Water (Transfer) Bills, were in each case negatived without a division.

The motion for the committal of the Lambeth and the Southwark and Vauxhall Water (Transfer) Bills to a Select Committee, which was moved on the 24th ult. and adjourned, was withdrawn, and the order discharged.

The other Bills relating to the water supply of the Metropolis which stood for second reading were the Kent Water Board Bill, the East London Water (Height of Supply) Bill, the Staines Reservoirs Bill, the New River Company Bill, and the Southwark and Vauxhall Water Bill. On the order for the second reading of the first-named Bill,

Mr. CHAPLIN said that, for the reasons he had already given, he must oppose the motion.

The motion was negatived without a division.

The East London Water (Height of Supply) Bill was postponed till the 14th prox.; and the Staines Reservoirs, New River Company, and Southwark and Vauxhall Bills were each read a second time.

Mr. CHAPLIN then moved—"That a Select Committee of nine members be appointed, four to be nominated by the House and five by the Committee of Selection, to whom all Bills promoted in the present session by the London Water Companies shall be committed;" and further—"That it be an instruction to the Committee (*a*) not to confer additional powers except so far as the same may be proved to the satisfaction of the Committee to be required for works or for the acquisition of land, the construction or acquisition of which cannot be postponed without detriment to the interests of the public; and (*b*) to insert, in any Bill authorizing the creation of further capital, provisions which shall prohibit the application of such capital to any purpose other than the construction of the works or the acquisition of the land for which it is authorized by the Bill to be raised, or for the expenses of the Bill."

The motion was agreed to.

The order (Feb. 17) for the committal of the Chelsea and Lambeth Water Bills, suspended from last session, was read and discharged, and the Bills referred to the Select Committee on London Water Companies' Bills. The Staines Reservoirs, New River Company, and Southwark and Vauxhall Water Bills were also referred to the Committee.

The following progress was made with Bills last week:—

Bills read the first time and referred to the Examiners: Birmingham Corporation Water Bill, British Gaslight Company (Norwich) Bill, Cheltenham Gas Bill, Cowes Gas Bill, Falkirk and District Water Bill.

Bills rejected on order for second reading: Chelsea, East London, Grand Junction, Kent, New River, and West Middlesex Water (Transfer) Bills, and Kent Water Board Bill.

Bills withdrawn: Lambeth Water (Transfer) Bill, Southwark and Vauxhall Water (Transfer) Bill.

Bills committed: Chelsea and Lambeth Water Bills [suspended from Session 1895].

Bills read a second time and committed: New River Company Bill, Southwark and Vauxhall Water Bill, Staines Reservoirs Bill.

Bills referred to a Select Committee consisting of Mr. A. H. Brown (Chairman), Mr. Briggs Priestley, Sir J. B. Stone, and Mr. Engledew, to meet on Thursday, April 16: Kirkcaldy and Dysart Water Bill, Lanarkshire (Middle Ward District) Water Bill.

Bills reported: Colwyn Bay and District Gas Bill, Fylde Water Bill, Guildford Gas Bill, Huddersfield Water Bill, Ilfracombe Gas Bill.

HOUSE OF LORDS COMMITTEE.

Wednesday, March 18.

(*Before Lord* POLTIMORE, *Chairman; the Earl of* STAMFORD, *Lord* STANMORE; *and Lord* KINNAIRD.)

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS BILL.

During the consideration of the British Gaslight Company (Norwich) Bill (*ante*, p. 629), Mr. Pember took occasion to ask that the Newcastle-on-Tyne and Gateshead Gas Bill, which stood next on their Lordships' list, might be postponed until the 18th inst. He said the Bill was opposed by (among other people) the Corporation of Newcastle-upon-Tyne. That body were to have a meeting on Tuesday to consider the Bill; and the result might be such as to lessen the labours of the Committee. He did not say the opposition would be withdrawn; but he could not help thinking that the time of their Lordships would be saved by the course he proposed. The other opponents acceded to the proposal,

which came from the Corporation themselves. He appeared for the promoters, who had no objection to the proposed adjournment. The Chairman, after consulting with his colleagues, said that though the result would be practically to leave the Committee nothing to do on Tuesday afternoon, he would accede to the learned Counsel's proposal.

The Bill came before the Committee to-day, as arranged.

Mr. POPE, Q.C., Mr. PEMBER, Q.C., Mr. STRACHAN, and Mr. RAM appeared for the promoters; Mr. BALFOUR BROWNE, Q.C., and Mr. PAGE, for the Newcastle-upon-Tyne Corporation; and Mr. BALFOUR BROWNE and Mr. HAMILTON, for the Gateshead Corporation.

Mr. POPE, in opening the case, said the Bill was promoted by the Newcastle-upon-Tyne and Gateshead Gas Company to empower them to purchase additional land, erect works, and raise further capital, and for other purposes. The opponents were the Newcastle-upon-Tyne Corporation and the Gateshead Corporation; but he thought he was justified in saying, from reference to the petitions of the two Corporations and the communications which had passed between the parties since the Bill was deposited, that the general purposes of the measure were admitted to be necessary and proper. It was not denied that it was desirable for the Company to have additional lands to construct new works; and that to carry out these works, additional capital would be needed. On this, the promoters and opponents were agreed. In truth, it was only in respect of some minor matters of adjustment—in connection with the supply of gas to public lamps, for instance—that it was desired that some modification of the provisions already existing should be made. Where the parties could not agree, they could invoke the intervention of their Lordships to say what ought to be the circumstances and conditions of the gas supply for the future; and they would, therefore, in all probability be a happy family, and be able to continue the present satisfactory course of things. The proposal of the Bill, as he had said, was to acquire certain lands in the township of Walker, which would be found set out in section 5 of the Bill. On this new land, it was intended to construct works; and for these works, new capital was needful. As the supply was common to the towns of Newcastle and Gateshead, both Corporations were entitled to be present to see that proper securities were provided. The Company proposed to take land at either extremity of the borough—at one end for the purpose of extending works, and at the other for the erection of new and improved works, for the erection of which the additional capital was required. He need not go into details as to the Company's method of gas manufacture, or price, or anything of the kind, because there was no complaint against the Company on the part of the municipalities. The two Corporations were satisfied; and the promoters were willing to deal with them by giving, when their new works were completed, increased illuminating power. Their price—1s. 10d. per 1000 feet—was so moderate that it would be hard indeed if there were any dissatisfaction on this score. The real questions at issue he would ask their Lordships to consider on the petitions of the Newcastle and Gateshead Corporations. The promoters had almost come to terms with the Newcastle Corporation—they were, in fact, in the very throes of agreement with them. He might almost say that they were agreed with the Corporation, and that the latter would not trouble their Lordships with any discussion of the Bill. In the course of a short time, he hoped to be in a position to state that the promoters had consented to the conditions which the Corporation desired to impose on them. The Company, however, had not had the same communication with the Gateshead Corporation. He would read the petitions—the same principle being involved in the two cases of Newcastle and Gateshead.

Mr. BALFOUR BROWNE: As the Gateshead Corporation are going to fight, perhaps if my learned friend will read their petition it will be sufficient.

Mr. POPE said he would not trouble their Lordships with the first seven clauses of the petition. Paragraph 8 was the first he would deal with; and it was as follows: "Your petitioners respectfully submit that the amount of further capital which the Company propose to raise under the Bill is excessive and ought to be reduced, and that the granting of these large capital powers, which would unduly prolong the time when the Company will be again before Parliament, is, in the interests of the public and of the consumers of gas, inexpedient; and inasmuch as the Company can borrow money at a low rate of interest, their borrowing powers under the Bill and under their Special Acts should be increased, and fixed at a sum not less than one-third of their nominal capital, and the Company should not be permitted to convert borrowed moneys into capital." The first fact of this allegation was formal. The promoters had satisfied both Corporations that the amount of their capital was not more than sufficient to carry out the works which, for the benefit of the community, they proposed to undertake. But, of course, the raising of capital was with them, as in all cases, a matter of importance. It was suggested that the Company should raise their capital by borrowing powers, which should be fixed at a sum of not less than one-third of their nominal capital; and they were prepared to agree to this. He believed they had the assent of the authorities, both in their Lordships' House and in the House of Commons, to the insertion of provisions making their borrowing powers one-third of their entire capital—following the line of the South Metropolitan Gas Act of 1882, which was generally the model on which these matters were arranged. There would, therefore, be no dispute between the Gateshead Corporation and the promoters on paragraph 8. The Company assented, generally, to the principle there enunciated. Paragraph 9 read: "By the Company's Special Act of 1864, they were required to provide and supply gas to the public lamps, and to light and extinguish the same, at a charge of 10d. per lamp per week. In the year 1873, by reason of the great increase in the cost of coals and materials and labour, which prevented the Company paying their statutory dividends, this charge was increased to 1s.; the maximum price of 3s. 4d. per 1000 cubic feet, which the Company were previously authorized to charge for gas supplied to private consumers in the boroughs of Newcastle and Gateshead, being at the same time increased as follows: To 5s. 4d. per 1000 cubic feet until June 30, 1877; and after that date, 3s. 4d. per 1000 cubic feet. Since that time, the circumstances of the Company have entirely changed; and notwithstanding that the cost of coal has fallen considerably, and the price charged to private consumers has been reduced from time to time, and now stands at 1s. 10d. per 1000 cubic feet, the Company have been able since 1879 to pay their full maximum statutory dividend of 7 per cent. The Company draw a large revenue from the borough; and your petitioners submit that it is only fair and reasonable that a proportionate reduction should be made in the Company's charge in respect of providing and supplying with gas the public lamps in the borough." Paragraph 10 was as follows: "By section 25 of the Act of 1873, the Company were required to erect within the borough, free of charge, such public lamps as the Local Authority directed, and to remove them to other situations when requested by the Local Authority, at the charge therein prescribed, and to clean and repair the public lamps at a uniform charge of 2s. per lamp per annum; but no provision was made for the discontinuance of a public lamp after it has been once erected. Your petitioners submit that it is unreasonable that, when a public lamp is once erected, it should continue for all time a charge upon the borough, although it may be no longer required; and they submit that provision should be made in the Bill for the discontinuance or removal of any public lamp which has become unnecessary from time to time, after the expiration of a reasonable period from the date of its first erection, or on such other terms and conditions as your Right Honourable House may deem equitable." On this, he had to say that the same principle had been raised by the Newcastle Corporation. He did not accept the statement made as absolutely correct; but it was substantially a description of what had happened. It did appear to the Company that it was fair for the Corporation to ask that they, in regard to the public lighting, should be put on as favourable terms as the largest private consumer; and they were prepared to agree that the gas for public lamps should in future be supplied at a price which represented that paid by the largest consumer—that was a sort of "favoured nation clause" on behalf of public lighting, with an addition of 2½ per cent. beyond, in recognition of the public duty of lighting. This discount was to apply in cases where the lamps were lighted all the year round, so that the Company might know what provision to make for public lighting, and not have capricious variations in the amount of gas required for this purpose. The price of gas on these terms was now agreed on between the Newcastle Corporation and the Company; and, of course, the Gateshead Corporation would have the benefit of the same terms. The Corporation were not put to the expense of providing the lamp-posts, and matters of that kind; the Company having been content to treat them as part of their regular distributing apparatus. Both Corporations had hitherto had the right, on the terms which had been indicated, to change or remove, or call on the Company to remove, any of the lamps and pillars to another station which they might find convenient at a particular time. This had been done by the Company in pursuance of their obligation, without cost to the Corporation. But a little friction had arisen in regard to the right of the Corporation to discontinue any particular light altogether. The Company were bound to protect themselves in this contingency, because they had, by agreement with the Corporation, a large amount of capital invested in lamp-pillars, &c., and if, either by caprice or for their own interest, the Corporation were to give up gas for public lighting, the Company would have thrown on their hands all the distributing capital which was useful for this purpose only. A discussion had arisen as to how far the Corporation had a right to discontinue the public lighting; and a modified agreement had been arrived at. It had been agreed with the Newcastle Corporation that the Company should have compensation for rendering their plant useless by reason of discontinuance of public lighting; but the Corporation were to have the right to discontinue 200 lamps per annum without paying compensation. The Company were prepared to extend the same terms to the Gateshead Corporation. The Newcastle Corporation were willing that the Company should do the work and charge them cost price.

Mr. HAMILTON: The Corporation of Newcastle want the option either to do it themselves, or permit the Company to do it.

Mr. POPE said the Company were willing to agree to supply gas of an illuminating power of 16 candles, tested at the works, or 15½ candles if tested elsewhere—say, at the town hall. Paragraph 11 of the petition read: "By the Company's Special Act of 1879, the several provisions of their former Acts, so far as the same were then in force and subsisting within the city of Newcastle-upon-Tyne, with respect to the purity, illuminating power, and method of testing the gas supplied by the Company, the persons who might be appointed to test the gas, and the notice to be given before taking the tests, were amended or repealed so far as related to the said city; and other and better provisions were enacted in their stead, and the prescribed testing-place was declared to be the testing-place then erected at the Company's works in Newcastle-upon-Tyne. These provisions should, your petitioners consider, be extended and made applicable to, and within, the borough; and the provisions of the Company's Special Acts regulating these matters as regards the borough should be repealed, and the Company should be required to provide a testing place for the borough at the town hall, or some other suitable place within the borough." Paragraph 12 was as follows: "The borough at the present time has an estimated population of 95,000, the great majority consisting of the working classes, who are, in a large number of cases, deterred from obtaining a supply of gas from the Company for the reasons that, in addition to having to provide the initial cost of installation of the gas, they are called on to deposit security for payment of the gas-rate, and the payment, in a lump sum at the end of the quarter, for the gas they consume often imposes a heavy burden upon them. From the experience gained in other towns where a method of supply and payment for gas by means of automatic meters—commonly known as the penny-in-the-slot system—has been in operation, your petitioners believe that the adoption of this system in the borough would confer a great benefit upon the working classes, who would eagerly avail themselves thereof to obtain a supply of gas for lighting and cooking, and would result at the same time in a substantial profit to the Company. They therefore desire to have a provision inserted in the Bill for giving the consumers an option to be supplied with gas on that system by the Company." The penny-in-the-slot system was a certain method of supplying gas, which had been adopted by the South Metropolitan Gas Company with great success; and in other places it was coming

into use. The Company were anxious to adopt it; but he did not think that the Gateshead Corporation should be in a position to compel them to put in meters on this principle wherever they might be asked for. It was in the interest of the Company to collect their gas-rate in the best possible way; and there was no doubt they would avail themselves of the use of this popular method of supplying gas.

The CHAIRMAN: You think they will do so?

Mr. POPE said the Company would; but they objected to any compulsory legislation. The best form of these meters was not yet settled; and it might be some ingenious workman might invent a scheme which would make the present style of meters very disadvantageous to the Company.

The CHAIRMAN remarked that the Committee would not agree to make the use of prepayment meters compulsory.

Mr. PAGE said there were 18,000 resident occupiers in the borough of Gateshead; and only 6000 of them had meters. The Corporation were of opinion that the use of gas in small houses might be very much increased by the adoption of prepayment meters. The Company charged a rent for the use of ordinary meters.

Mr. POPE stated that the Company charged a meter-rent of 10 per cent., as the life of a meter was ten years. They only received the bare value of their outlay; and they paid all the expenses of keeping meters in repair.

Mr. BALFOUR BROWNE said there were one or two other points on which they must ask the Company to give way. They thought the Company ought to be content with borrowing powers increased to the extent of one-third of the whole capital, instead of the new capital asked for. If this was agreed to, he should be satisfied. As it was, the Company would have borrowing powers which would enable them to keep away from Parliament for the next thirty years; and thus the consumers would be debarred from making any new arrangements.

Mr. RAM pointed out that the clauses of the Bill which gave the Company borrowing powers, only did what Mr. Balfour Browne had asked for.

Mr. BALFOUR BROWNE said the other point on which his clients were not willing to give way was as to the charges for public lighting of the streets. Previous to the year 1873, the Company charged the Corporation 10d. per lamp per week; but in that year, owing to the coal famine, the rate was raised by voluntary arrangement to 1s. per lamp. The price of gas to consumers was also increased, on the proviso that within three years it should be reduced. But the price of lighting the public lamps had never been reduced since that year, although the cost of coal had come down from 17s. in 1873 to 6s. at the present time. If the Company would consent to reduce the price charged for the public lamps from 1s. to 10d., further opposition would be withdrawn.

Mr. RAM stated that the Company would meet the Corporation by giving them 2½ per cent. discount, as though they were the largest consumers of gas—which they were not.

A discussion then took place between Counsel, after which

Mr. BALFOUR BROWNE said the Company offered to grant the full discount to the Corporation; but this offer was coupled with a condition which would give no benefit to the Corporation. There would be about £470 a year saving on the public lamps; but the Company insisted, before the discount was given, that the Corporation should light the lamps all the year round. If they did this, they would have to spend £700 a year more in gas; thus being actually worse off than at present. If the Company would withdraw this demand, the Corporation would accept the offer.

Mr. PEMBER said they could not do this. The Corporation must take their choice. They must economize either by using less gas, or by taking their discount. They could not have it both ways.

The CHAIRMAN: Why do you not light all the year round?

Mr. BALFOUR BROWNE replied that Gateshead was a small borough; and some of it was a good deal scattered. It was altogether unnecessary to light the lamps all the year round in some parts.

Mr. PEMBER, having intimated that the case must go on, called

Mr. *L. W. Adamson*, the Deputy-Chairman of the Newcastle and Gateshead Gas Company. He gave particulars as to the prices and discounts for gas in Gateshead and Newcastle. The Company had to supply the lamps and standards, and lay down pipes wherever they were required. They could not afford to give Gateshead the full discount, unless the lamps were used all the year round, as the plant would be lying idle.

Cross-examined by Mr. PAGE: He knew that Newcastle had three times the population of Gateshead; and that it was half as large again. The lighting of the streets was at the discretion of the local authorities. The charge of 16s. 8d. per lamp covered the cost of the mains and of repairs and maintenance. They would still get this under the Bill. They could not afford to make fish of Newcastle and flesh of Gateshead. They had the power to break up the streets free of charge.

Re-examined by Mr. PEMBER: He had never heard of any gas company paying for the right of breaking up streets. The discount offered to the Gateshead Corporation put them in a better position than private consumers by 2½ per cent. Besides this, the Company had raised the illuminating power.

Mr. PAGE said the position the Corporation took up was that if they accepted the offer of the Company, they would be worse off than at present. Up to 1873, the Company were able to supply the Corporation with gas at the rate of 10d. per lamp. Owing to the coal famine, the price was raised by agreement to 1s. They were willing to pay by meter and take the discount, or to pay at the old rate of 10d. per lamp. He asked their Lordships to say that if they were to have the 17½ per cent. discount, they should be allowed to exercise their own discretion as to how much gas they should use.

Mr. *F. Winter*, accountant, examined by Mr. PAGE, said the offer made by the Company would lead to a loss by the Corporation.

Cross-examined by Mr. PEMBER: What he meant by loss was that it would cost the Corporation more; but they would be using a greater amount of gas, and would have their lamps lit all the year around.

Alderman *J. Lucas*, Chairman of the Parliamentary Committee of the Gateshead Corporation, examined by Mr. PAGE, said the rates of Gateshead amounted to 6s. in the pound. Only partial lighting was required in some parts of the borough.

Cross-examined by Mr. PEMBER: He wanted the clause in the Act of 1875 repealed, which enabled the Company to charge 1s. a lamp.

The Committee then adjourned until the following day, in order to enable the Company, to draft a clause dealing with the public lamps.

Thursday, March 19.

On the resumption of the proceedings this morning,

Mr. POPE said the best course to follow would be for the Agents to the promoters (Messrs. Dyson & Co.) to bring the Bill up as they had amended it, according to the understanding entered into on the previous day. If any alteration was required, it could be explained to their Lordships.

The CHAIRMAN: Are you practically agreed?

Mr. POPE: I think so, my Lord. The Gateshead Corporation might still desire to intervene; but their objections could be taken as the clauses were proceeded with.

The clauses were then gone through *seriatim;* several being postponed to the end for the insertion of verbal alterations.

On clause 33A, it was mentioned by Counsel for the petitioners that there was an undertaking that the new clause proposed by the promoters should be submitted the previous night. This had been done, and the petitioners had examined it; but he understood that the clause now brought forward was a different one.

The CHAIRMAN: We should have the clause you saw last night.

The Parliamentary Agent then read the following new clause:—

Section 25 (public lamps) of the Act of 1873 is hereby repealed; and in lieu thereof the following provisions shall apply to the City of Newcastle and the Borough of Gateshead respectively, hereinafter called the Corporations: The Company shall provide and erect, free of charge, such public lamps, with proper and sufficient service-pipes, stop-cocks, and all other apparatus necessary for the proper lighting thereof and for the supply of gas thereto from the Company's mains, as the Corporations shall from time to time direct in their respective districts. And the Company shall remove any public lamp from one situation to another when directed by the Corporations, at a charge of 15s. for each lamp so removed. And the Company shall remove any public lamp from the street or other situation in which it is placed when directed by the respective Corporations to be discontinued, at a charge of 7s. 6d. for each lamp so removed. Provided that if, in the case of the City of Newcastle, more than 200 lamps are discontinued in any one year, or if, in the case of the Borough of Gateshead, more than 75 lamps are discontinued in any one year, the Corporation discontinuing such lamps shall pay to the Company in respect of all lamps discontinued by it beyond the above mentioned number, such compensation for the loss sustained by the Company by reason of the discontinuance of any lamp beyond the said authorized number as shall be agreed on between the Corporation and the Company, or as settled by arbitration. The Company shall supply gas to every public lamp at the lowest price per 1000 cubic feet for the time being charged to any consumer; and the quantity of gas consumed in each quarter shall be ascertained by such method of computation as shall be agreed upon between the Corporations and the Company, or failing agreement, by such method based upon measurement as shall be agreed upon between the Corporations and the Company, or determined by an Arbitrator to be nominated by the Local Government Board. Provided that in any year in which all the lamps shall be lighted on every day, the rate of discount to be allowed to the Corporations, shall be 2½ per centum in addition to the rate allowed to the largest private consumer. The Company shall light and extinguish the public lamps at, and during, such times and periods as shall from time to time be directed by the Corporations, and shall maintain, clean, and repair the public lamps; and the Corporations shall pay to the Company at the end of each half year the actual expense incurred by them during that half year in such lighting, extinguishing, maintaining, cleaning, and repairing such lamps—the amount thereof, in case of a difference, to be certified by the Public Auditor for the Company. Provided that the Corporations may, if they think fit, at any time, on giving to the Company twelve months' previous notice in writing, undertake the lighting, extinguishing, maintaining, cleaning, and repairing of the public lamps, subject to the provisions of this section with respect to the discontinuance of lamps.

Mr. HAMILTON, on behalf of the Newcastle Corporation, said that there had evidently been a misunderstanding in this matter, as his clients had not agreed to the 2½ per cent. discount. They were under the belief that it had been arranged that a discount of 17½ per cent. should be allowed them.

Mr. POPE could not accept this view of the case. The clause which had been read embodied the various points he had put to their Lordships the previous day in his opening speech, and on which he understood the Corporation of Newcastle were agreed with the Company. Mr. Balfour Browne, who represented the Corporations, had requested that he should, for the benefit of Gateshead, make an explicit statement of the agreement which had been arrived at with the Newcastle Corporation; and he had done so. He had thought that they were agreed; and he had not been undeceived, because when he made his statement Mr. Balfour Browne and the Corporation retired. Some misunderstanding appeared to have arisen upon the question of the allowance of the 2½ per cent. discount; but the clause as it stood carried out what he had stated. He had said: "Provided that in any year in which the lamps shall be lighted on every day in the year, the rate of discount to be allowed to the Corporations shall be 2½ per cent. in addition to the rate allowed to the largest consumer." The discount of 2½ per cent. was to apply only where lamps were lighted all the year round, so that the Company would be able to know what provision to make for public lighting, and not have capricious variations in the amount of gas required for the purpose. The clause embodied this. It put the Corporations of Newcastle and Gateshead, first of all, on the terms of the least price charged to the largest consumer; but, secondly, if they kept their lamps lighted every day in the year, it gave them the additional advantage over the largest consumer of 2½ per cent. discount. His (Mr. Pope's) intention had been as clear as daylight; and it would be for their Lordships to say whether the 2½ per cent. should be claimed by the Corporation in case they did not light their lamps every day of the year. How the misunderstanding which seemed to exist had arisen, he could not make out. As he had pointed out, the Corporation of Newcastle had retired; and the promoters fully understood that they had given their sanction to what he (Mr. Pope) had said. It was important—not as a question of money against the Corporation, but as a matter of principle—that this distinction should be maintained. He did not wish to compel the Corporation of Newcastle to light every

day, if they did not choose to do so; this was a matter for their own discretion. The 2½ per cent. discount was an inducement to them, not compulsion upon them, to light every day; because if they did so, they would get the 2½ per cent. extra. There must be some conclusion of the kind. If the Company put the Corporation on better terms than the most favoured private consumer under their present Act of Parliament, there must rest upon them some additional service or obligation, to entitle them to such special treatment. If, without any conditions, they gave the Corporation the 2½ per cent. discount, *plus* the discount allowed to their largest consumers, they would be having these consumers coming to them and saying: "We must have this 2½ per cent." There were larger consumers than the Corporation. How would they be able to reply to Lord Armstrong's firm, or the consumers of enormous quantities of gas, that they could not allow them the 2½ per cent? They must treat their consumers equally. The customers would say: "But you allow it to the Corporation." Under the clause the Company proposed, the reply would be: "We only allow it to the Corporation as an inducement to light every day. The Corporation need not light every day; but if they did not, they would have no right to the 2½ per cent." This was a fair thing to do; but the Company could not differentiate between their customers, unless the Corporation did something or other to entitle them to the extra allowance. This was the whole matter between the Company and the Corporation. On all other matters, there would be no difficulty in arriving at an agreement.

The CHAIRMAN said the parties had agreed; and therefore the whole question could not be re-opened.

Mr. HAMILTON declared that the percentage agreed upon between the parties was 17½; no mention having been made of any conditions as to lighting every day.

Mr. POPE said that there might have been a misunderstanding; but if Mr. Hamilton wished to extend his claim, he (Mr. Pope) would withdraw his offer altogether.

Mr. HAMILTON stated that the Corporation would be placed in a worse position than the private consumer, who was not bound by any conditions.

The CHAIRMAN: All this should have been discussed yesterday. The Committee understood that an agreement had been come to. Instead of this, it seems as if the Bill were being re-opened.

Mr. HAMILTON said he desired to call Mr. Motum, the Town Clerk of Newcastle, to prove what took place at the interview between the parties.

Mr. *Motum* was then called. He stated that on Tuesday afternoon, a meeting took place at the Westminster Palace Hotel of the Parliamentary Committee of the Council—the Mayor presiding. On the following morning, they had a conference with the promoters; and the matters then discussed were the charge for lighting public lamps, and the question of the illuminating power of the gas. On the other points, they were practically agreed. The Parliamentary Committee urged on the Company that they ought to have 20 per cent. reduction for prompt payment, instead of 15 per cent.; and ultimately the Company compromised the matter at 17½ per cent.

Mr. POPE: I am willing to accept Mr. Motum's statement that he understood the arrangement to be what he says; but I cannot acquiesce that this was the arrangement.

Mr. *Motum:* There may have been some misunderstanding in this room; but there was none at the Westminster Palace Hotel.

The room was then cleared. On the readmission of the public,

The CHAIRMAN said: The Committee are unanimously of opinion that the Corporation of Newcastle shall receive 17½ per cent. deduction, provided they light all the year round; but that no compulsory clause as to such continuous lighting shall be inserted in the Bill.

Mr. HAMILTON: Does that apply to Gateshead, my Lord?

The CHAIRMAN: Yes; whatever applies to Newcastle, refers also to Gateshead.

Mr. HAMILTON: I am instructed to say that my clients will not discuss the Bill any further in your Lordships' House.

Mr. PAGE made a similar statement on behalf of the Newcastle Corporation.

The preamble was then declared proved; and the Bill was ordered to be reported.

HOUSE OF COMMONS COMMITTEE.

Thursday, March 26.

(*Before Sir* W. CODDINGTON, *Chairman; Sir* L. LYELL, *Viscount* WEYMOUTH, *and Mr.* JOHNSON-FERGUSON.)

GUILDFORD GAS BILL.

This Bill, which is principally to authorize the Guildford Gas Company to make a short railway, construct additional works, convert their capital into stock, and raise further capital, came before the above-named Committee to-day.

Mr. SHIRESS WILL, Q.C., and Mr. PEMBROKE STEPHENS, Q.C., appeared for the promoters; Mr. C. BAGGALLAY represented Messrs. E. and A. Miles, Limited, petitioners against the Bill.

Mr. SHIRESS WILL, in opening the case for the promoters, said the points in dispute would occupy the attention of the Committee for but a very short time. The major part of the measure was unopposed; and he would briefly point out what this portion referred to. The Company were first formed under parliamentary powers in 1857. Their capital was then £20,000, with £5000 borrowing powers. In 1874, the gas limits were considerably extended; and the Company obtained further powers to raise £30,000 of capital, and to borrow £7500. Since 1874, they had had no fresh capital; and as the Committee knew, gas companies almost doubled themselves in ten to fifteen years. Since 1874, the Company had had to meet the growing demands of an increasing population, for building had been going on very briskly in the town. The capital of the Company was exhausted; and in order to enable them to meet their engagements in the future, they were obliged to come to Parliament for more money. What happened when a company came for more capital nowadays? They put themselves under the sliding-scale, limiting the dividend on the new capital; and they submitted to the auction clauses, under which whatever premiums were derived from the new capital were put to capital purposes and earned no interest, and in this way the consumer got the benefit. The Company proposed to put themselves under all these conditions, and to raise a sum of £100,000 of new capital to meet their wants. The Committee would be prepared to hear that the Local Authority of Guildford—as was customary with local authorities—were exercised in their minds as to what the Company proposed to do; and they at first petitioned against the Bill. But every point on which they had any criticism to make, had been settled and adjusted with them; and accordingly the Bill was what was called a "filled up" Bill, with many alterations. All the alterations had been made to satisfy the criticisms of the Local Authority, who were now perfectly satisfied with the Bill as it stood. The Company proposed to convert their stock into 5 per cent. stock; and with this the Corporation were satisfied. At present, they had some stock at 10 per cent., some at 7½ per cent., and some at 7 per cent. These stocks were confusing; and there was further difficulty by reason of the fact that the stocks had been granted at different times, so that the public did not know which had priority. It had therefore been deemed advisable to convert the stock into a 5 per cent. one, as was done, for example, in the case of the Crystal Palace Gas Company. There was no opposition to this proposal; and now he came to the only points on which the Bill was fought. He would ask them to turn to the petition of Messrs. E. and A. Miles, Limited. Paragraphs 1, 2, and 3 were narrative. Paragraphs 4 and 5 were as follows: "(4) By clause 4 of the Bill, the Company seek powers to make and maintain in the parishes of St. Nicholas and Stoke-within-Guildford, in the County of Surrey, a railway 1 furlong 3·41 chains in length, commencing in the said parish of St. Nicholas, Guildford, at a point on the east boundary of the goods yard of the London and South Western Railway Company, thence crossing the River Wey, and terminating in the parish of Stoke-within-Guildford, at the north-eastern boundary of the existing gas-works of the Company, and to enter upon, take, and use such of the lands shown on the said plans as are required for those purposes. (5) By clause 5 of the Bill, it is proposed, in addition to the other lands to be taken under the powers of the Bill, to enter upon, take, and hold and use the lands and hereditaments described in Part III. of the First Schedule to the Bill; and by clause 6, the time limited for the compulsory purchase of the said lands shall not be exercised after the expiration of three years from the passing of the Bill into an Act." Paragraph 6 said: "Your petitioners are a limited Company, carrying on an extensive and increasing business as timber merchants and contractors, and their premises and works appertaining thereto adjoin and abut on the present works of the Company; and they are also owners of lands and other property situate between the present works of the Company and the River Wey. They have laid out large sums of money in connection with their business, and erected buildings and works thereon, the chief of which is a steam laundry, and which they have leased to a company called the Guildford Steam Laundry Company." As to that, he would only say that the Steam Laundry Company were not petitioning here. Paragraph 7 was: "Under the powers of the Bill, it is proposed, in the construction of the proposed railway, to interfere with a narrow road which runs from the said River Wey past your petitioners' property and the existing gas-works, to a main road called Onslow Road; and if the powers sought for by the promoters of the Bill are granted, the road, being within the limit of deviation of the lands proposed to be taken for the construction of the said railway and for the extension of their gas-works, the Gas Company could stop up and discontinue such road as a thoroughfare; and your petitioners allege that any interference therewith would prevent the necessary access to their business premises, and thereby lessen the value thereof, and prevent any future development of the same, and no compensation for the serious loss your petitioners would sustain could compensate them or their tenants." He would, of course, answer all these charges. Paragraph 8 read: "Your petitioners have been served with notice as being within 300 yards of the lands proposed to be used by the Company for the extension of their gas-works and the manufacture of residuals thereon; and your petitioners strongly object to the Company having any further powers given them in this respect." He might say that similar notices had been served under the Standing Orders on 600 other persons; and no one save the petitioners had objected. Paragraphs 9 and 10 were: "(9) The Company's limits of deviation extend on the east side thereof close up to your petitioners' steam laundry (now occupied by the said Guildford Steam Laundry Company); and the proposed railway will be constructed on a high viaduct which will overlook and interfere with the light and air necessary to the carrying on of such business and the general working of the said steam laundry, and will likewise have a most prejudicial effect on that part of your petitioners' property, and will seriously interfere with their tenants' business, and place them at a great disadvantage. "(10) Your petitioners submit that it is contrary to public policy to grant to a gas company the powers of making a railway for their own profit and advantage, and to the disadvantage and damage of other commercial undertakings in the vicinity; and that, as the powers sought to be obtained are not for the public advantage, but only for the Gas Company's private benefit and gain, the same should not be sanctioned." And then, finally, the petitioners said that the preamble was untrue. Well, the Company in the present works were, so to speak, "cribbed, cabined, and confined." They were full up; and if they were to meet the demands which were being made on them, they must have more land on which to develop their works. This land had been acquired—it had been actually purchased by some of their Directors, who, if the Bill passed, intended to offer it to the Company at cost price. The Company had a piece of land which they bought two years ago from these very petitioners, to be used in connection with the gas-works. The Directors had acquired the piece of land to which he had referred, and with it a road—not a public road, but one over which the petitioners had a right of way; and what the Company proposed to do was this: At present, they had to cart everything connected with the gas-works through the streets—their coals and residual products, including coke. They proposed to make a private railway siding

of their own—one of the commonest things in the world—to which there was no objection on the part of anybody but the petitioners. The Company were willing to push that siding as far as possible away from the premises of the petitioners, and put it entirely on the land to be acquired by the Company—not on the road at all. The petitioners could not object to this. At a certain point, the road would have to be crossed by the railway, in order to reach the gas-works. The road was 12 feet wide, and the line would cross in such a manner that the petitioners' right of way would in no sense be interfered with. What remained? He gathered that his learned friend (Mr. Baggallay) suggested that the laundry business would be injured through the proximity of this siding, which meant, he supposed, that the siding might cause coal dust to be scattered. There was no outside drying at the laundry, which had seven windows facing the land on which the siding would be run. The Gas-Works Clauses Act was an answer to any fear on the part of his learned friend's clients, for it would prevent the Company doing anything that would cause annoyance to their neighbours. If their works became a nuisance, an injunction could be obtained under section 29 of the Act of 1847.

Mr. BAGGALLAY said he should take exception to his learned friend appealing to this section in connection with the construction of a railway. A railway did not come within the terms of making and supplying gas.

Mr. SHIRESS WILL said he did not agree with that; he was willing to put a chause in the Bill stating that the Gas-Works Clauses Act should apply to the working of the siding. He asked if this would satisfy the petitioners.

Mr. BAGGALLAY: We wait to see how much farther you are going yet.

The CHAIRMAN asked to have the clause referred to read.

Mr. SHIRESS WILL said it laid down, in effect, that nothing that the Act contained should prevent the undertakers from being liable to indictment for a nuisance, or to any other legal proceeding to which they might be liable, in consequence of making and supplying gas. That covered everything—all the operations necessary for making and supplying gas—and should include this siding; but he would not argue that point. He would consent to put in the clause, in order to make the matter quite plain. His learned friend's clients were protected by the general law. The siding would be entirely on the Company's own land; and as regarded interference with the light and air of the laundry, the siding would be far away from that place of business. The gas-works had been in their present situation since 1857; and the petitioners only came there four or five years ago with their laundry, when the Company's works were pretty nearly full. He would call before the Committee an Engineer and one other witness, to speak as to the large amount of building going on in Guildford.

Mr. *Corbet Woodall*, M.Inst.C.E., examined by Mr. PEMBROKE STEPHENS, said he was a Civil Engineer in large practice, more particularly in connection with gas undertakings. He had had wide experience, both in the construction and the management of these concerns, and was Consulting Engineer to many undertakings at home and abroad. He was Consulting Engineer to the Guildford Gas Company. The questions arising in this case were particularly familiar to him.

Mr. PEMBROKE STEPHENS: Is it the fact that gas manufacturing and gas requirements have much increased of late years in Guildford?

Witness: Yes; and everything has been done to conduct things properly at the gas-works. But it is felt that the time has been reached when there must be some extension. Indeed, the enlargement of the works ought to have been undertaken two or three years ago. They are very much crowded; and the Company are working at a disadvantage in consequence. He went on to say the Bill proposed the purchase of additional land for the erection of new works. It also contemplated the extension of the gas-works, and the construction of a branch railway in connection with the main line. The Bill had proved itself satisfactory to the municipal body of Guildford. They at one time did petition against the Bill. But this had led to the discussion of various matters; and the measure as it now stood had received their approval. The capital of the Company at present was satisfactory; being small in proportion to the business done, which showed that the works had been conducted by the Directors with economy.

Mr. BAGGALLAY said it might shorten the proceedings, if he said at once that he did not intend to go into questions affecting capital at all. His opposition would be as to the railway.

Witness, continuing, said that the usual amount of capital would be taken for the construction of the new works and railway; and provision would be made for selling the capital under the auction clauses. Moreover the Company would henceforth work under the sliding-scale clauses, by which the dividend would depend on the lowness of the price of the gas—that was to say, the lower the price the more would be the dividend. The Company had placed themselves under the most modern conditions; they were thoroughly up to date. The land now used for manufacturing gas was $2\frac{1}{2}$ acres in extent. The Company had, in addition, half an acre of land; but they had no statutory right to make gas on it. It was occupied, but not with gas-making works. The land it was proposed to acquire was $3\frac{3}{4}$ acres in extent; and if this was obtained, it would give the Company altogether $6\frac{3}{4}$ acres. The existing land was certainly not large enough for the convenient and economical manufacture of gas. They had to keep their coal in odd corners; and having no means of storing coke, they were obliged to sell it at once. The point had been reached at which it was necessary to extend the works; and it was desirable that they should be extended in the same neighbourhood as that in which the Company had hitherto carried on their operations. The land acquired adjoined the existing works; and the quantity proposed to be taken was by no means excessive. It was necessary for gas companies—especially those who were doubling their business every ten years—to look a little ahead. Witness thought the proposed new works would be a distinct advantage both to the Company and the public. He considered it would be a great advantage to have the branch railway, for several reasons. From the point of view of the town, it was desirable that the coal used at the works should not be carried over the public roads; and as regarded the Company, an economy would be effected, if not this year, at any rate in future years, as the business of the Company grew. They were spending £600 a year on carting coal. The cost of the siding would be £10,000; and when it was constructed, coal could be brought over it and dropped into the works—almost into the retorts. He also thought the siding would be an improvement from the point of view of their neighbours, as the amount of dust spread would be less by the railway than by the carts. He did not think that the railway would effect much economy in the matter of taking away residuals. A little tar might be removed by its means; but he was in hopes that the coke would still be sold at, and carted from the works. Turning to the petition against the Bill, the petitioners said they were timber merchants and contractors; and in this capacity they would not be interfered with by the proposed new works any more than at present. But the petitioners also let out part of their property as a laundry. There was a road leading up to these premises, over which the petitioners possessed a right of way. This road was not at present used by the Company. The petitioners said that, under the Bill, the road could be stopped up; but there was no intention of doing so, as it would not be a desirable thing to do. The Company would cross, but not block it. They would run their line over the road on girders, and leave a clear width of 12 feet inside the supporting pillars. The construction of the branch railway, therefore, would not interfere with the road in any way. The railway had been pushed back as far as possible; and beyond the crossing over the road—which was essential—every effort had been made to avoid it. Speaking for the Directors, he could assure the Committee that they were prepared to do all they could for the convenience of their neighbours. He could not see that the petitioners would be in any way interfered with; and consequently he could not admit that they had any right to compensation. As to the gas manufacture, it would be carried on in the future with less danger of being a nuisance than at present; and as to light and air being taken away, the allegation was unfounded. There was no claim made in respect of ancient lights. The petitioners had only been in their present situation four years; and they had no right to prevent even the building of a high wall by the Gas Company opposite their laundry. An adjoining owner had a right to run up a wall as high as he liked, so long as he did not interfere with ancient lights.

Mr. PEMBROKE STEPHENS: Is there anything in the case of these petitioners which needs special consideration?

Witness: I think not. No doubt the site they chose for their laundry, in close proximity to a gas-works, is an unfortunate one. They have built a gas-works of their own close up against the laundry, which must make some amount of dust.

You know that the petitioners have sold some land to the Gas Company for the purpose of extending the works?—Yes; I take it that that is so. It does not look, therefore, as though the petitioners objected to the proximity of the gas-works. There has been no complaint as to the works of the Gas Company.

Cross-examined by Mr. BAGGALLAY, witness said that the land the petitioners had sold to the Company was not in front of the laundry; and at the time the sale was effected, the Company had not acquired land in that position. The Company were not the owners of the road which ran alongside of the laundry; but under clause 5 of their Bill, they sought to take and use the old cricket ground and roadway, and to construct new works for making and storing gas thereon. As the Bill stood, the road might be used as a site for works for making gas, depriving the petitioners of their right of way; and the gas-works might be constructed right up to the windows of the laundry. But the Directors did not wish to acquire the petitioners' right of way—at any rate, they did not desire to deprive them of it. The rail level would be 16 feet high at the place where it passed the laundry. The line would run along girders over pillars, and would be higher than the windows of the laundry, which were 11 feet from the ground.

Mr. BAGGALLAY: What would be the distance of the railway from the laundry?

Witness: Speaking as the Engineer advising the Gas Company, I would not put the railway further back than 30 feet from the laundry windows. That would not be the least distance between the railway and the laundry. They would approach within 21 feet; but I would not in any part go back more than 9 feet from that distance.

Do you know that the land of the petitioners abuts on the River Wey?—Yes.

And do you know what the terms of the lease of the laundry are?—No. We are not interfering with it; and it never occurred to me to inquire into its position.

In reply to further questions, witness said he did not know that the petitioners had 24 horses stabled on their land, in connection with the timber and contracting business. He had said that the petitioners had made an unhappy choice of a site for their works. He did not mean to say that they should have anticipated that the Gas Company would buy up the old cricket ground and the road; but they must have known that, with a progressive business such as theirs, the Company would be obliged to extend their works. Looking at the price of land in the district, and all the circumstances of the case, he considered that the petitioners had not made a wise selection in a site for their laundry. The railway, it was estimated, would entail a charge of 2d. per ton to the Gas Company on the coal carried over it. The coal could be brought at a level of 15 feet above the gas-works, and could be shot down in front of the retorts—saving the cost of elevating, carting, and depositing at the retorts. The railway would be useful for taking away coke. The Gas Company were doubling their business every seven years; and as it was not proposed to come back to Parliament for another 14 or 15 years, it was now sought to make provision not only for the present but for the future.

Mr. BAGGALLAY: Up to this morning, have the Gas Company attempted to make any concession to the petitioners?

Witness: I do not know. I will go so far as to say that I was astounded at this petition when I first read it. I thought that surely it was a matter that ought to be arranged between the parties.

Re-examined by Mr. PEMBROKE STEPHENS: The points of difference between the petitioners and the Company were so small, that he was surprised that steps had not been taken to come to an agreement.

Mr. PEMBROKE STEPHENS: So are we.

Witness, continuing, said that if things went on as at present, the Gas Company would be cramped in their working. The proposed railway would give them a short and easy way of bringing in their coal—

60 or 70 tons per day—and would largely facilitate the carrying on of their business. The railway siding was a proper and necessary adjunct to the gas-works. He believed that the prospect in front of gas was better and brighter than he had ever known it. Two developments—one at each end of the social scale—had led to a great access of business. He referred to the automatic meter system and the cooking-stove. The present charge for carting the coal was £600 a year, and the cost of carrying by the railway would be £750; but that was a matter for the Directors of the Company, who knew their own business, and had nothing whatever to do with the petitioners. He believed that the Laundry Company were not petitioners against the Bill.

Mr. JOHNSON FERGUSON: I understand that the Gas Company are prepared to insert a clause in the Bill declaring that the petitioners' right of way shall not be interfered with.

Mr. PEMBROKE STEPHENS: That is so.

Mr. *E. M. Lunn*, Architect and Surveyor, of Guildford, stated that the area of supply of the Gas Company had a population of 37,000. In the past twenty years, 1900 new houses had been constructed; and building was going on at present very rapidly. He gave details as to the building operations in progress; and said he could see no reason why this extension should be arrested. In his view, the site proposed in the Bill for the extension of the gas-works was the most eligible one in the district—he should say the only one.

This closed the case for the promoters.

Mr. BAGGALLAY then addressed the Committee on behalf of the petitioners. He pointed out that the land belonging to the petitioners had been conveyed to them by Lord Onslow. They at the same time obtained a right of way from Lord Onslow, who, of course, could not subsequently interfere with it. When the land was acquired and the right of way obtained, the petitioners had no idea, and could have no idea, that the workmen's cricket ground would be bought by the Gas Company for an extension of their works, or that anything would be done to minimize the rights of the petitioners. The Gas Company had got three Directors to go to Lord Onslow and acquire from him the cricket ground; and now, under the Lands Clauses Act, they sought to do that which Lord Onslow could not have done—namely, deprive the petitioners of their right of way, and erect their works close up to the laundry, to the great detriment of the property. The Gas Company could not do this unless the Committee gave them power; and he therefore appealed to the Committee to hold the balance evenly between the two parties, and to see that no damage was done to either. The learned Counsel described the nature of laundry work; and showed how essential it was that those engaged in carrying on the business should have plenty of light and air. The Committee would see how detrimental to the laundry it would be to have a railway constructed in front of its windows and only 30 feet away, to be engaged day by day in carrying large quantities of small, dusty coal. The Laundry Company might not be present; but that might be owing to their lease being on the point of expiring. And whether they were present or not, the petitioners surely were justified in appearing to defend their property, and in claiming that ample compensation should be paid them for the damage which the Bill would effect. The new clauses which Counsel for the Gas Company suggested would be no protection to the petitioners, if his learned friend was right that they had no claim for compensation.

Mr. PEMBROKE STEPHENS said that ordinary law would give the petitioners whatever compensation they were entitled to.

In reply to the Committee, Mr. BAGGALLAY said the first break in the Laundry Company's lease would occur in three years' time. There had been no negotiations begun between the petitioners and the Gas Company.

Mr. PEMBROKE STEPHENS remarked that there had been negotiations between the Gas Company and the Laundry Company, but not between the Gas Company and the petitioners.

Mr. BAGGALLAY said he understood that the petitioners had the previous day approached the Gas Company, but that they would have nothing to do with them.

No evidence being called for the petitioners, the room was then cleared. On the re-admission of the public,

The CHAIRMAN said: The preamble of the Bill is proved. The Committee are of opinion that right of way should be clearly reserved by a clause; and also that, in the event of the Gas Company building a wall on the boundary of their land, leaving the right of way open, it shall not be high enough to obstruct the light. Evidence was given to the effect that the Company might build on their own land a wall as high as they liked.

Mr. PEMBROKE STEPHENS: That was an assertion of legal right; but we shall be prepared to act with reason.

The CHAIRMAN: It would be unfair to build a high wall in front of the laundry.

Mr. PEMBROKE STEPHENS: This is a matter entirely outside the Bill; but the Committee's expression of opinion will not be without weight with the promoters.

The CHAIRMAN: Where the railway crosses the road near the laundry, it must not interfere with it.

Mr. PEMBROKE STEPHENS: No; the full width of the road will be maintained.

Mr. BAGGALLAY: Do the Committee say that opposite the laundry the railway shall be put back 30 feet?

Mr. PEMBROKE STEPHENS: No; that is what the Gas Company offered you; but you would not accept it. You must now abide by the Engineer's discretion.

The CHAIRMAN said the point was one which must be left open to the Company. The railway ought not to come within 25 feet of the laundry.

Friday, March 27.

To-day the Committee considered the clauses of the Bill.

Mr. PEMBROKE STEPHENS said that there was no point involved, so far as he knew, except the right of way. The promoters of the Bill would obtain no power under the measure to alter the existing right of way. With regard to the construction of the railway, he was willing to come to terms with his opponents to keep it 25 feet away from the laundry.

The CHAIRMAN remarked the Committee were distinctly of opinion that the railway should not be constructed within a less distance than that which had been indicated.

Mr. PEMBROKE STEPHENS said the limit which he had agreed to was 25 feet. As to the opposition put forward by the proprietors of the laundry, he was willing to give them all the advantages which they could gain in regard to a claim for ancient lights. Any form of clause that the Committee desired would be adopted by the promoters of the Bill. He suggested that a clause should be incorporated under which only an ordinary fence wall should be built in front of the laundry.

The CHAIRMAN: Something to that effect was in the mind of the Committee.

Mr. PEMBROKE STEPHENS then submitted to the Committee a clause designed for the protection of Messrs. Miles.

The CHAIRMAN said the Committee were not satisfied that the interest of the laundry was properly safeguarded. It was their intention that nothing else than an ordinary fence wall should be built in front of it. Of course, the Gas Company were entitled to take in the whole of their land for their own purposes; but they would not be permitted to put up a wall that would interfere with the access of light to the laundry.

Mr. PEMBROKE STEPHENS stated that the wall would be only of the height of an ordinary fence wall.

Mr. BAGGALLAY said he must ask the Committee to put into the hands of the successors and assignees of his clients the same powers as were vested in the present owners of the land. They might desire to sell the land; and therefore their successors should have the same protection.

The CHAIRMAN did not imagine that Counsel on the other side could take objection to a provision of that kind.

Mr. PEMBROKE STEPHENS pointed out that the protection asked for had regard to a laundry—not to the land upon which it was built. So long as the place was used as a laundry, protection was reasonable; but if the laundry should disappear, he did not see why the protection should be continued.

The CHAIRMAN said it could make no difference to the Gas Company if the laundry were pulled down and another building put up in its stead.

The Committee decided that the clause for the protection of the Messrs. Miles should stand part of the Bill. There were other slight modifications made in the clauses; and the Bill then passed the Committee stage, and was ordered to be reported to the House for third reading.

COMMITTEE ON UNOPPOSED BILLS.

Wednesday, March 25.

(*Before Mr.* J. W. LOWTHER, *Mr.* G. LAMBERT, *and Mr.* CHANDOS LEIGH.)

ILFRACOMBE GAS BILL.

This Bill, which is to empower the Ilfracombe Gas Company to acquire lands and construct additional works, extend their limits of supply, convert their existing and raise more capital, and for other purposes, came to-day before the above-named Committee.

Mr. TORR, Parliamentary Agent, appeared for the promoters.

Mr. *Ffinch* (Messrs. Ffinch and Chanter, solicitors, of Barnstaple) was called, and explained in detail the principle adopted in the conversion of the Company's shares, which he said was the same as in the Oxford Act of 1892. What they had done was to give the various classes of shareholders an equivalent in 5 per cent. stock, as it was found inconvenient for a small concern to have a multitude of different kinds of stocks.

Mr. CHANDOS LEIGH called attention to clause 43 of the Bill, which provides for the conversion of borrowed money into capital.

It was arranged that this should be at 4 instead of 5 per cent., as it stood originally. Some additional clauses were introduced. A proviso to clause 4, which extends the limits of supply to Morthoe, Berrynarbor, and Combmartin, provides that if, for a period of eight years from the passing of the Act, or four years from the time the Company shall commence to manufacture gas on the lands to be acquired (whichever time shall first expire), they shall not have carried a gas-main for the supply of gas as far as the High Cross, Combmartin, they shall not be deemed to be a company authorized to supply gas within that parish; and the Combmartin Parish Council, or other local authority, shall be at liberty to provide gas throughout the district. A proviso to clause 9 was added. The clause gives power for making subsidiary works, and the proviso enacts that if at any time the Company construct a tramway between the foreshore at Hele Beach and the site of the proposed new works, the tramway shall not be laid down in such a way as to permanently interfere with the surface of the main road between Combmartin and Ilfracombe, but shall be carried under the road in a tunnel.

Mr. CHANDOS LEIGH said clause 62A, which was now introduced, was a most important one. For the last few years Parliament had always insisted upon 15-candle gas. The original Bill fixed 14 candles; and the price was formerly 5s. per 1000 cubic feet. By the new clause, the illuminating power was increased to 15 candles; and the price reduced to 4s. 6d.

Mr. *Ffinch* stated that the requirements of the Local Government Board had been complied with; and the District Council had agreed to one or two matters that had been submitted to them.

The Bill was then passed by the Committee, and was ordered to be reported, with amendments.

Saltash Water Supply.—Sanction has been given by the Local Government Board to the application of the Saltash Corporation for permission to borrow £2000 for works of water supply. The water is to be obtained from Plymouth; and the Town Council have decided to instruct Mr. Masterton to prepare specifications for taking the main under the River Tamar.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Saturday, March 28.

(*Before Mr. Justice* CHITTY.)

The Meteor Incandescent Lighting Company, Limited, v. The Incandescent Gas-Light Company, Limited.

This was a summons on behalf of the defendants to have paragraph 7 struck out of the statement of claim.

Mr. WALTER, who appeared in support of the summons, said there were cross actions—one by the Meteor Company to restrain the Incandescent Gas-Light Company from publishing certain threats; and the other by the Incandescent Gas-Light Company against the Meteor Company for infringement of their patents. The writ in the threats action was issued on Nov. 20, 1895; and the one in the infringement action on Nov. 27, 1895.

Justice CHITTY asked if he was to go into the whole question over again.

Mr. R. WALLACE, Q.C., who appeared for the Meteor Company, said he might save the time of the Court by stating that if the Incandescent Company were going to try the validity of their patents in the infringement action, his clients did not want to try the same question over again in the threats action.

After some discussion, it was arranged that all proceedings in the Meteor Company's action for threats should be stayed until after the decision of the Court in the infringement action.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Monday, March 23.

(*Before Mr. Justice* WILLS.)

The Incandescent Gas-Light Company, Limited, v. The De Mare Incandescent Gas-Light System, Limited.

This case was put in the paper to be mentioned this morning (though the arguments were practically concluded the previous Friday), in order that a further explanation might, if possible, be given of the failure of the defendants' expert witnesses to make successful mantles with the Hähn chemicals, using ammonia.

Mr. BOUSFIELD said further experiments had been made; and what might prove to be an important discovery had been arrived at by Dr. Hehner. He found that a solution of Mirck's zirconia, when treated with oxalic acid, gave a white precipitate as usual; but, on the addition of excess of oxalic acid, that precipitate was not, as usual, redissolved. The liquid remained turbid; while boiling also produced the same effect.

Mr. MOULTON said it was a well-known allotropic form.

Mr. BOUSFIELD remarked that if it was well known, it was rather strange it had not been mentioned before. The same result had not been found with any other zirconia; and it appeared that Mirck's had only recently been put upon the market. It was in a different form—viz., a scale; while the ordinary form was a powder. What these scales were, or how they were made, was, of course, not known; and he did not suggest that there was anything else in it. It was quite evident that the presence or absence of nitrate of potassium had nothing to do with it; and the only conclusion they could suggest was that there were two modifications of zirconium—as there were in the case of tin, where they had stannic oxide and metastannic oxide; but he did not tie himself to any theory. The fact was all he had to do with. This fact was that Hähn's zirconia, on being treated in a certain way, could be brought into a similar condition to Mirck's; and it seemed as if this different condition of the salt might have some influence on its behaviour in the presence of ammonia. Telegrams had been sent both to Hähn and Mirck; and the former house informed them that their zirconia was made from zircon—a well-known mineral which contained only zirconia and silicon, so that there could not well be any impurity in it. Messrs. Mirck had not sent any reply. Dr. Hehner had tried to repeat Mr. Ballantyne's experiment; but at a certain stage of the process, he obtained a precipitate of sulphur, which he could not get rid of without using means not mentioned by Mr. Ballantyne. These means he did not think he was justified in adopting; and therefore he failed to produce the result.

Mr. MOULTON said his experts did not consider that what had been stated was either a discovery or important. They said there was not a single nitrate of zirconium with which they could not make mantles with perfect ease. Dr. Hehner had been obliged to admit that he did not work with pure nitrate, but with a large quantity of impurity.

Mr. BOUSFIELD: Only potash.

Mr. MOULTON said he attempted to excuse working by these impurities by saying they were impurities which did not matter. He had now made further experiments, and found there were cases in which it did matter. The evidence already given showed the plaintiffs had taken every zirconia, made it into nitrate by taking the impurities out, and proved that it worked perfectly.

Justice WILLS said it appeared to him as if it came to this—that the plaintiffs had experimented with zirconia from all the sources from which they could get it, and always succeeded; but the defendants succeeded in finding something which would not do. He thought they might take Mr. Bousfield's statement without going through the form of calling Dr. Hehner to give evidence.

Mr. BOUSFIELD considered it would be more satisfactory to have the evidence given.

Dr. *Hehner* was, therefore, recalled. He narrated the experiments he had made, as stated by Mr. Bousfield. He made them all in conjunction with Dr. Dupré, who was not able to be present that morning—having to attend an Ordnance Committee at Woolwich. He took the ordinary zirconia of commerce——

Justice WILLS said he did not understand that expression, because the evidence of Professor Lewes was that the only commercial use of zirconia was in some experiments and lectures which were given to show that zirconia might be substituted for lime in the limelight.

Mr. BOUSFIELD said he would put in a trade-list in which zirconia was priced in 1883.

Justice WILLS remarked that no doubt it might have been used by chemists in laboratory experiments.

Mr. BOUSFIELD said Professor Lewes's experience was chiefly as a gas chemist. Here was a printed price-list in which these things were mentioned—metallic zirconium in two forms, chlorate in crystals, and oxide, with the price per gramme. It was a German list.

Mr. MOULTON understood the price was about 500 guineas a pound.

Mr. BOUSFIELD remarked that that had nothing to do with the price. He could not take his friend's evidence.

Dr. *Hehner* (continuing his evidence) said, according to the re-actions as stated in the text-books, the effect of treating the solutions of a salt of zirconium with oxalic acid was that at first a precipitate was obtained which again dissolved in excess of the acid. There was no hint that there was an oxalate which was insoluble. It was the recognized characteristic of zirconium that its salt was soluble in oxalic acid; whereas thorina, which was the nearest to it, was only partly soluble, and this method was used for separating the two. He had tried it in a test-tube; and it remained clear after two days, and also after boiling for an hour. He had applied the same test to Mirck's zirconia which was handed him by Professor Dewar, making the same strength solution under the same conditions throughout. He obtained a precipitate which was dissolved on adding excess of oxalic acid; but after standing two or three minutes, it became turbid and remained turbid. It also became turbid on boiling. This zirconia, therefore, behaved differently from that of any zirconia he found described in the text-books. He had made as many experiments as he could in the time, to account for the difference. He found that if he took Hähn's zirconia, and put it through a course of preparation, he could make it into its abnormal zirconia. The addition of 10 per cent. of nitrate of potassium made no difference in either case. The zirconia the plaintiffs handed him was in the form of fine scales; and he was told it was not a recent introduction. He knew of no other in the market having the same appearance. He only knew of zirconia nitrate as a white powder. At first he thought he had to deal with a different material—a substance not zirconia; but he had separated the precipitate, and determined its amount under various conditions, and again dissolved it, and could not then make it agree with the normal behaviour. He was ultimately convinced that it was an allotropic modification of zirconia and of its salts. It had probably been known that there was an insoluble zirconia hydrate and a soluble one; but it had not been well known, and he had found no evidence of it, that there was this difference towards re-agents in solution. He had tried to follow out Mr. Ballantyne's experiment as described the previous Friday. He said he dissolved the nitrate in water, precipitated it with sodium hyposulphite, and thus dissolved the precipitate by means of hydrochloric acid. Then he precipitated the hydrate of zirconia from that solution by means of ammonia. He followed the process up to the last step; but when he obtained the hyposulphite precipitate, and treated that with hydrochloric acid, he obtained the usual separation of sulphur which always took place. In spite, however, of every attempt at coaxing it, boiling it, filtering it through double papers repeatedly, it was impossible to remove all the sulphur. Of course, he could have easily oxidized the silver out of the solution; but as Mr. Ballantyne had said nothing about this, he did not venture to do it. No doubt, Mr. Ballantyne had not given complete detailed information how he did it.

Cross-examined by Mr. MOULTON, as to the details of the process, witness adhered to the evidence that he had formerly given, that he had failed to make a successful mantle with pure zirconia. He had not only tried Hähn's, but a sample obtained from Hopkins and Williams.

In re-examination, witness said he had been engaged in this work nearly every hour since the Court rose the previous Friday.

Justice WILLS asked to whom any experimenter could have applied in 1885 for zirconia if he wanted any.

Dr. *Hehner* said it could have been obtained from any chemical dealer. It was no doubt rare; but it could be procured by anyone who was willing to pay the price.

Mr. *Swinburne*, recalled, and further examined by Mr. MOULTON, said he was quite prepared to accept the statements of Dr. Hehner; but he did not think the allotropic form, as it had been called, of the zirconia had anything to do with the success or non-success in the making of mantles. His assistant, Mr. Cooper, had a little trouble in analyzing Mirck's zirconia, from the very cause Dr. Hehner had described. First he thought thoria was present; but he found it was not so. He was prepared to take any specimen of nitrate of zirconia, and after proper purification make mantles of it.

Cross-examined: It was a recognized method to separate thorina from zirconia by oxalic acid. He did not know how far this fact was known to people who made a speciality of the rare earths; but it was unknown to him, and to his assistant until recently. But he could not connect the successful making of mantles either with the normal or abnormal behaviour of the zirconia. He did not think success could be due to the use of Mirck's zirconia, because he made successful mantles with the two bottles of the 1885 solution handed him by Mr. De Fonblanque. There appeared to be some mystery in the matter, which had not yet been solved.

Mr. MOULTON said he would challenge his friend to produce any zirconia which, when properly purified, would not make mantles.

Mr. BOUSFIELD said, of course, he could not do it at the moment; but if time were allowed him, he had no doubt he could do so.

Mr. *Ballantyne* was then recalled. He said the filtration of the sulphur only took about an hour in his experiment. He knew that zirconia would sometimes give a colloidal precipitate in oxalic acid, as he had come across the ammonia once or twice. He did nothing with the Hähn's sample except purify it.

In cross-examination, witness would not admit that there were two varieties—one normal and the other abnormal. He could not account for the difference in the two varieties. He had been ten years with Mr. Tatlock. His first experience with the rare earths was in 1892, in reference to some analyses of some varieties from Norway.

Professor *Dewar*, recalled, said the hydrated oxide of zirconium was sometimes colloidal. He knew of this peculiar variety of precipitate from the work he did in making solutions, and testing them. But he never found it made any difference in the nitrate produced; and he did not believe there were two varieties of nitrate.

Cross-examined: The probability was that, on adding a sufficient quantity of oxalic acid, a solution in both cases would be obtained. There might be a turbidity in one case, and not in the other; but he should not pay any attention to that. He did not suggest that if any quantity of oxalic acid were added to the test-tube produced by Dr. Hebner, the flocculent matter would dissolve. If he saw such an appearance, it would simply lead him to purify the salt.

Re-examined: He knew no ground for suggesting that there were two nitrates of zirconium. He superintended the whole of Mr. Ballantyne's operations. He never took the slightest notice whether the solution was opalescent or not; no chemist would.

Mr. BOUSFIELD then suggested that his Lordship should instruct an independent expert to report to him upon this matter, as it was evident there was a mystery which was unsolved.

His LORDSHIP, after some discussion, however, said if he found it necessary, he would do so.

This closed the case; judgment being deferred.

Incandescent Gas-Light Company, Limited, v. Sunlight Incandescent Gas-Lamp Company, Limited, and Others.

The Counsel appearing in this case were—For the plaintiffs: Mr. MOULTON, Q.C., Mr. T. TERRELL, Q.C., Mr. A. J. WALTER, and Mr. J. HUNTER GRAY (instructed by Messrs. Faithfull and Owen); for the defendants: Mr. BOUSFIELD, Q.C., Mr. ROGER WALLACE, Q.C., Mr. JENKINS, and Mr. EMERY (instructed by Messrs. Maddisons).

Mr. MOULTON said this action was brought on the 1885 patent, which had been discussed in the former case, and also on the subsequent patents. He should have to deal chiefly with the 1885 patent and on one other, granted to Haitinger. The defendant Company had either come into commercial existence or were intended to, to make mantles exactly similar in appearance to the Welsbach, and differing only in the substances used. He need not go over the preliminary ground again. After Welsbach's original discovery, everything which followed utilized that invention. They all adopted the earthy skeleton; but numerous attempts had been made to construct mantles which should have all the qualities of the Welsbach, but should be held to be outside the patents. In the present case, the defendants took a line very different from that of the last defendants; and instead of taking zirconia and a rare earth, they took other things. They took zirconia for one. Welsbach also mentioned that to make a strong hood alumina could be used. They took alumina, which of itself would give a poor light, though it gave good coherence to the skeleton. All experience showed that it was necessary to have this earthy skeleton, if incandescence were to be successful; and the defendants took alumina and endeavoured to make it give a good light by the addition of other matters. They dipped the mantle in a solution of chromic oxide, so as to get a coating of chrome; but it was still formed upon the original Welsbach skeleton—made by the patented process. He should submit that this made no difference with regard to the infringement of the 1885 patent; and, in addition, they infringed the later patent of 1891, which was for the purpose of improving Welsbach, and was subordinate to it. Haitinger described the mixture of chromium oxide and aluminium oxide, which would give a better light than either of the substances by itself. He also mentioned several substitutes—including calcium oxide—for alumina; while the chromium oxide might be replaced by manganese. In preparing the lamps, the oxides might be mixed directly, or by using salts which were afterwards converted into oxides, as in the Welsbach process. The composition of the defendants' mantles would appear to be this: They did not rely simply on zirconia and alumina to make their mantles, but added to it a small percentage of a rare earth, which they claimed to be a secret. It was not to be desired that trade secrets should be disclosed; but a man could not be allowed to set up such a secret to escape the consequences of infringing another man's patent. He should submit that defendants had undoubtedly infringed either Welsbach or Haitinger, according as they made their mantles. The only attack on the validity of Haitinger was Dellwik of 1890, which was owned by defendants; and it was because of this patent he thought they were going to set up, that they made their mantles in two operations. Dellwik's patent was for improving an incandescent mantle by subsequent treatment. He stated that one of the greatest defects in incandescent gas-lights was the short life of the mantles. He spoke of the incandescent bodies in ordinary use as non-conductors; and he proposed to add a material readily conducting heat so as to concentrate the effect of the heat, and so utilize the flame of the gas to the greatest possible extent, but so that it would have no deleterious effect on the lamp. He said he preferred to put this material on a portion only of the mantle from which the light was emitted. It was rather difficult to understand what he meant. He referred to several metals (including copper), and also to the oxides of the rare metals; and he mentioned the possibility of altering the colour of the light as desired. His specification could not be an anticipation of Haitinger, because the latter made his mantles at one operation, while Dellwik first made them, and then coated them with refractory oxides. He (Mr. Moulton) should call as little evidence as possible; the main portion of the case having been already covered in the previous action.

Mr. *J. Swinburne* was the first witness. He said he had considered Haitinger's specification, and also that of Dellwik, and had read the depositions of Professor Crookes, made in this case, as to what was done by the defendants. Haitinger made a compound of aluminium and chromium oxide. A little chromium being added to the aluminium made it, he said, a good mantle. Alumina behaved like the oxides mentioned in Welsbach's specifications, when treated in the same way. When chromium oxide was added, it underwent some change—lost its green colour, and became a ruby tint. There was no essential difference between a mantle of zirconia and alumina and those described by Welsbach—he should call it a cheap edition. Zirconium was in a group by itself, with silicon and alumina. He had had a sample of the defendants' mantles handed him, and had made two analyses. They consisted of alumina, zirconia, and a little chromium oxide. He did not find the secret substance referred to by Professor Crookes. The proportions were in one case about 30 per cent. zirconia; 61 per cent. alumina; and a little more than 8 per cent. of chromium oxide. In the other 52 per cent. of alumina; 31 per cent. of zirconia; 16 per cent. of chromium oxide. Probably in that case a little of the alumina had been estimated as chromium. He thought the secret substance might be glucinum; but he could not find it. The mixture was practically that given by Haitinger. Dellwik's specification was for improvements in the treatment of incandescents. He did not limit himself to any particular form; but he gathered that he was thinking of such lamps as Clamond's or Fahnehjelm's. It might be taken to cover treating a mantle of the Welsbach type, though not specially alluded to. The words of the specification referring to magnesia, lime, zircon, &c., seemed to bear out this idea. He appeared to have had some curious fallacy in his mind with regard to the conduction of heat. He proposed to coat non-conducting bodies with something which had conductivity without injuring the light. Mantles, however carefully made, were not perfectly true in form; and portions might not be all equally incandescent. He mentioned a large group of metals—copper, platinum, cobalt, tungsten, &c. In his opinion they would be very ineffective for such a purpose. Their action would not be all the same, he should think; but he had not made any experiments. Unless used in very small proportions, they would spoil the mantle. With a metallic coating there would be no light. The patentee gave no directions which any efficient workman could put into practice and produce a good result. He (witness) considered the governing words in the specification were "treating incandescents."

Cross-examined by Mr. BOUSFIELD: The patent did not exclude a Welsbach incandescent; but he believed it was not specially referred to. He did not think the language suggested that he was dealing with a Welsbach type of incandescent. At this time, there were no incandescents in use in England except Welsbach's. If it referred to a Welsbach mantle, it would probably be to one which had been burned off. The application of chromium would have the same effect, whether added before burning or after. It would be more convenient to do it before burning. He should prefer mixing alumina and chromium together before dipping; but if not allowed to do this, he should prefer to dip in alumina and burn off, and then dip in the chromium. Dellwik referred to an incandescent made of lime or magnesia. If this were taken and afterwards saturated with chromium, the result would be much the same as Haitinger. He did not suggest that 16 per cent. of chromium would spoil a mantle. Dellwik referred to employing any well-known process, and to mixing the oxides directly, or to mixing the salts and converting them into oxides by heat. That was also included in the claim. He did not say how the mixed oxides were to be applied. Haitinger might be read to include threads or pins of the oxides, as well as mantles saturated with them. Practical results could be obtained by following Dellwik's directions. If only little enough chromium were used, it would answer; if too much, it would not. It would be possible to arrive at the correct proportions by trial. His view was that defendants' mantles were an infringement of Welsbach's 1885 patent; although they were composed of alumina, zirconia, and chromium. It would be the same if zirconia and chromium only were used. The chromium itself he regarded as outside Welsbach. He should think a mantle made by soaking a fabric in a solution of zirconia or alumina and then burned off would be (to use Mr. Moulton's words) a Welsbach earth-skeleton. He did not think Stokes-Williams conveyed any definite idea, although, with the knowledge obtained by the working of the Welsbach patent, it was possible to read a meaning into it. He proposed taking a piece of muslin, dipping it into a salt, and afterwards treating it with a metallic solution, and then burning it off. But witness thought he contemplated electric deposition of the metallic coating—not the formation of it by heat from a salt. Witness's view of the Welsbach 1885 patent was that the chief element was the process. Even a calcium mantle, or magnesia, or zirconia would be a cheap edition of Welsbach. Zirconia was now getting more expensive; though its price had been reduced very greatly since early times by the discovery of fresh sources of supply. He thought the title of Welsbach indicated that the process was the important point. It was difficult to say whether his opinion of the relative importance of the process and the materials was due entirely to reading the specification or was partly the result of later knowledge. No doubt, Welsbach attached considerable importance to the materials used and to the proportions. The specification indicated what were the best materials; but it did not tell a person what materials he might not use. He thought a fair-minded man discovering that the addition of chromium would make a good mantle of calcium, would come to the conclusion that he had brought calcium within Welsbach. The whole novelty was in the use of the solutions; and a fair-minded man would not take that invention. It was true the claim referred to the "substances mentioned." He did not see anything there which referred to calcium; and calcium would be excluded by other portions of the description. But if an addition to calcium prevented it being excluded by those general words, it might be included in the class. It would depend on the result. He had made analyses of defendants' mantles. There was no lanthanum, yttrium, ytterite earth, or any of the rare earths in any appreciable quantity. If there had been any of the cerite earths, it would have been found. Reverting to the question of ammonia, witness said it was important to know that there were no impurities present in the re-agents. It was usual to perform dummy experiments for the purpose of ascertaining the presence of such impurities. Hyposulphite of potash might contain impurities. He could not say, however, that such impurities would be greater in amount than those left in Hähn's zirconia after precipitation with ammonia. He did not remember seeing photographs of the fibres of ammoniated mantles. The use of ammonia made the mantles more friable; but he thought not much more. Photographs were put in; and witness said the ones purporting to represent fibrils which had been ammoniated were decidedly inferior.

Justice WILLS said it seemed evident dropping the ammonia was an advantage; but it did not follow that it would invalidate the patent.

Cross-examination continued: The words "treated as set forth" referred to the process after the impregnation. He did not think anyone reading that would necessarily infer, on reading the specification, that the treatment with ammonia was important. He must be more or less of a chemist; and he would know the result would be to produce a hydrated oxide. There was no indication that the ammonia might be dispensed with.

Re-examined: The application of heat to the ammoniated salts brought one back to the same point again—that was a not unusual phenomenon in chemistry. Stokes-Williams included in one description a number of things which had totally different properties, some of which would burn and some would not. There was nothing in Dellwik which specially included a Welsbach mantle; but there was nothing to exclude it. Dellwik was described as resident in Illinois. Haitinger's patent was for an improved manufacture of a substance; and witness thought he intended to claim the application of his invention to such things as the limelight as well as to such things as Welsbach's mantles. With regard to the 1885 patent, if a mantle were made with chromic oxide alone, it would not work. It would be a dull green thing, which would give no light. Adding the chromium to something which did form a coherent mantle was quite a different thing, and in his view brought that other substance within Welsbach.

Further cross-examined: Witness had made many experiments with reference to ammonia—nitrated ammonium. When heated, it volatilized into laughing gas; and the remainder was water. This did not occur in the treatment of these mantles, because a decomposition took place before the requisite temperature was reached. He did not assert that the reconversion was complete; and that probably accounted for the mantles being somewhat weaker. He was not aware of any reference to this reverse action in text-books published in 1885.

Further re-examined: His first impression on reading the specification was that ammonia would spoil the mantles; and finding it did not, he made many experiments to discover why it did not. In this way, he ascertained the fact of the reverse action he had spoken of.

Mr. *G. J. Sargent*, an official from Somerset House, was next called to prove the incorporation of the defendant Company on Jan. 16, 1895. There were no Articles of Association; but Table A applied. There was an agreement filed on May 1, 1895, with Mr. Leopold Morris.

Mr. TERRELL said he would have this copied and put in.

The further hearing was then adjourned to Friday.

Friday, March 27.

When the case was resumed this morning,

Mr. *Ballantyne* was called on behalf of the plaintiffs, and examined as to the Dellwik specification, which he said he carefully considered; having experimented upon the lines there laid down. He had experimented with magnesia, lime, and zircon, and coated incandescent mantles made of these substances with the heavy metals mentioned by Dellwik, according to the directions given; and also with the other compounds mentioned. He had tried alumina. The witness then referred to his notes; and described first his experiments with magnesia. He took the nitrate, containing 8·5 per cent. of the oxide; and having dipped mantles in the solution, divided them into two lots. After drying one lot, he burned off at once. The other he treated with different solutions. He found the magnesia mantles, when burned, very fragile; and they gave hardly any light. They could only be coated with another solution by carefully painting it on. Those he treated before burning, he only dipped half way into the second solution. Some of these he produced, which had been dipped in solutions of cobalt, chromium, platinum, tungsten, nickel, and other oxides. A magnesia mantle, he considered quite impracticable. When dipped in chromium, the illuminating power was much improved. It had a greenish colour after burning; but he did not consider it a practical mantle. [One of these mantles which had been burned was produced; and it had nearly fallen to pieces. Another was burned in Court; and it gave a very red and poor light over an open bunsen burner. When put on a Welsbach burner, with a chimney, the light was much improved; but it was still of a very reddish orange colour.] Witness stated that this was the best result he had been able to obtain with magnesia and chromium. With cobalt, he found a very similar result. Magnesia was a very poor incandescent, so that it did not take much to improve the light. Tungsten gave a better light; but the mantle was very fragile. Platinum gave hardly any light; and copper the same. The strength of the metallic solutions was 1 per cent.; and he believed that was the best strength. The second series, which were burned off before the second dipping, were so fragile that he could not get a successful result. Witness next described his experiment with lime, in which he used acetate, because the nitrate went off like fireworks. Speaking generally, the results were similar to the magnesia, but not quite so good. The best example was the one dipped in tungsten. One of these was burned off on an open flame, when it contracted so much that it could not be placed on the Welsbach burner; and when handed to his Lordship, it fell to pieces. Platinum and copper furnished a dull red glow, but practically no light. Didymium gave a better light; but it was very fragile. He could not make a commercial mantle out of the whole series. The experiments with nitrate of zirconium were next described. The solution was 10 per cent.; and it gave a nice mantle, fairly coherent, and of moderate illuminating power. When dipped in chromium, the light was diminished. This fact was illustrated in Court by an experiment. The zirconia alone gave a remarkably good light; but a mantle which had been dipped half way in a solution of chromium, was much less efficient.

Justice WILLS said the two specimens were not comparable.

Examination continued: Cobalt reduced the light in about the same degree as chromium. Tungsten did not affect the light, but made the mantle very fragile. He also tried zirconia; dipping after burning, in didymium, cerium, and silica. They all reduced the illuminating power in varying degree. Mantles made with alumina, and afterwards treated with chromium, showed an improvement in illuminating power. Cobalt gave a poor light. [Two experiments were then shown, with alumina alone, and also after treatment with chromium. In the first case, the mantle contracted so much in burning off that it could not be placed on the burner. The same thing happened with the chromium, though to a less extent. It was mounted, but gave only a moderate light.] Tungsten furnished a fair light; but the mantle was very fragile. Witness heard the evidence of Dr. Hehner as to the behaviour of Hähn zirconia. In his opinion there was no form of zirconia nitrate which would not make mantles when treated with ammonia. In purifying the Hähn zirconia, he used hyposulphite of soda, because he considered that was the best method. He had since dissolved some of Hähn's zirconia in water, and precipitated it with dilute ammonia; then filtered it, and washed twice with hot water. He then dissolved the zirconia hydrate, dissolved it in nitric acid, and evaporated it until it had a strength of 3·28 per cent. of the oxide. He mixed the solution with an equal volume of plaintiffs' lanthanum nitrate, and made two successful mantles. He then evaporated the solution still further, until it contained 12·35 per cent., and on mixing it with an equal volume of lanthanum nitrate, he again made two successful mantles. He then took some of the zirconium hydrate, dissolved it in nitric acid, diluted it, and reprecipitated it with weak ammonia. He then filtered the hydrate, washed twice with hot water, and then pressed out the remaining water. He then divided the hydrate into two parts. The first he dissolved in nitric acid, evaporated it down, diluted and filtered it, giving a solution of nitrate of zirconium. On testing the solution with oxalic acid, the precipitate was insoluble in excess of oxalic acid. The solution succeeded in making an ammoniated mantle.

Justice WILLS said they would not pursue that question; as defendants admitted that the insoluble variety succeeded.

Witness then described what he did with the second part of the zirconia hydrate. He dissolved it in nitric acid, evaporated to dryness, dissolved the residue in water, and evaporated. On testing with oxalic acid, the precipitate was completely soluble in excess, and remained so for 40 minutes. On mixing some of this nitrate with lanthanum, and treating with ammonia, he made two mantles with complete success. He believed he was safe in undertaking to make good mantles with any samples of zirconia, if he were allowed to purify it properly.

Cross-examined by Mr. WALLACE: Dellwik gave no direction in his specification to dip the mantles in the solution. The directions were to coat, paint, or saturate. He did paint, but did not try a spray. He did not think of it, as he succeeded in painting with a camel's hair brush. He could not get a satisfactory mantle with magnesia alone. It was important, in carrying out an invention, to know what materials should be used. Practically, magnesia and calcium made worthless mantles; and he had not produced a commercial mantle with alumina. Zirconia alone made a fair mantle; but the addition of chromium did not improve it—rather the reverse. He did not call it a commercial mantle as the term was now used. He had not read Haitinger's patent hitherto. He saw the first claim was for aluminum and chromium oxide; and the second was for the same, with the substitution of oxide of zirconium for the aluminum. These were practically the materials he had used without success, when dealing with Dellwik. Magnesium as a substitute for aluminium he could not say would be commercially successful; and the same answer applied to calcium. He used 1 per cent.; and he saw that was the proportion indicated by Haitinger. That probably meant 1 per cent. in the mantle; whereas he used a 1 per cent. solution, which was not the same thing. He thought a 1 per cent. solution would be the most likely strength to succeed; and he tried no other strength. He tested some mantles, coating them entirely; and they did better, in so far that there was not so much warping. The alumina solution was 8·94 per cent. He also tried a stronger solution; but it was not so successful. The amount of light depended on the strength of the solution to some extent; and it varied with different bodies. Alumina coated with chrome gave fair illuminating power; but he did not call it a success, because the mantle warped so. With regard to the experiments with zirconia and ammonia, it was a usual thing to use hot water for washing zirconia hydrate precipitate. He did not know that it was mentioned in text-books; but it was a common practice in laboratories. In the last experiment, when he dissolved the zirconium hydrate in nitric acid, the latter was in excess. He evaporated to dryness; and as it left a dry white powder, he did not think there could be any nitric acid left. He did not, however, test it for nitric acid. If free acid had been present, it did not follow that it would have kept the zirconia in solution in the oxalate. Mirck's zirconia was pure; and the whole of his experiments were made from one sample. Dealing with this, he got some nitrate, which gave an insoluble precipitate and some which gave a soluble one. He attributed the difference to the presence of a basic nitrate.

Justice WILLS said the question on this point seemed to be reduced to whether washing, such as the witness had described, would be a precaution which an ordinary chemist would take in a laboratory. It would be a strong thing to upset a patent on such a point as that.

Re-examined: He had converted Mirck's nitrate of zirconium into what was called the insoluble form, and had made a successful mantle. In dealing with Hähn's zirconia, he washed less than usual, simply because time was so short. The precipitate was gelatinous; and it was usual to wash such precipitates in hot water. He did not believe there was any connection between the two forms of the nitrate and success or failure. He had never failed with zirconia which he had properly purified. He had made no experiment on Dellwik's lines, mixing the ingredients before dipping; but he had seen such a trial, which produced a very good mantle. He had not time to experiment with varying strengths of solutions; but he believed a stronger solution would produce an inferior result.

Further cross-examined: His idea was that Mirck's nitrate of zirconia in scales was more basic than ordinary; and this accounted for the precipitate being insoluble. Treating it as he had done, the scales disappeared; and the nitrate appeared in the ordinary form of a white powder.

Mr. *Dugald Clerk* was the next witness. He was examined by Mr. MOULTON on the question of the solubility of oxalate of zirconium, and said he had looked up some old books, including "Fresenius" (1869 edition) and "Watts," in which the oxalate was described as insoluble. A modern Russian author made the same statement. The insolubility referred to could not therefore be called abnormal. He witnessed a portion of Mr. Ballantyne's experiments. His method of procedure

was proper and usual. He took part in some of the work; and he concurred in the evidence already given. He did not think the success of the mantles was connected with the solubility or otherwise of the nitrate. He had read Haitinger's specification, and had made experiments upon it. He made successful mantles in that way. He understood Dellwik's theory, but considered it was erroneous. It was intelligible, but not well-founded. The only combination he had tried was the chromium and alumina.

Cross-examined by Mr. BOUSFIELD: He did not agree with the statements in the books he had produced, that oxalate of zirconia was insoluble in an excess of oxalic acid. It was possible to produce a score of books containing an exactly opposite statement. He regarded the insoluble precipitate not as an oxalate, but as a hydrate. The statement had been altered in the later editions of "Fresenius." Instances of such behaviour were not uncommon in basic salts. If one modification succeeded in making a mantle, and the other did not, it would be important; but in his view that was not the case. One could make mantles with both modifications, if they were pure; and he attributed the failure to the presence of impurities. When the nitrate of potash impurity was removed from Hähn's zirconia, it would make a mantle. Mirck's zirconia did not fail when 10 per cent. of nitrate of potash was added to it. It did not follow that the same thing resulted on adding an impurity to a basic salt. He had heard that the addition of impurities did not prevent a mantle being made, if ammonia were not used; but he could not speak from his own experience. He believed the mantles made from Hähn's purified zirconia would stand collodionizing; but it had not been tried. He had made many mantles according to Haitinger. In Dellwik, there was a vague description of a number of things. In Haitinger, the description was much more definite. He proposed to mix his materials before making the mantle, whereas Dellwik's patent was for improving an existing incandescent body by coating it. It was more applicable, in his mind, to such a thing as the limelight or a Clamond burner. He agreed with Professor Swinburne, that practically there was no difference between dipping a mantle in a mixed solution and dipping it consecutively in two or three solutions. In some respects, there was a difference—especially when the burning off made the mantle very fragile. He did not call a mantle an incandescent one, until it was burned off; but he agreed that Welsbach's 1885 patent contemplated the mantle being supplied to the customer before it was burned off. Dellwik's specification was in some respects nonsense—where it contemplated a metallic coating, for instance. In the case of an alumina mantle, it would not necessarily follow that the inside of the mantle would be hotter than the outside. The inside layer of the bunsen flame was the coolest, as it did not get so much oxygen. Going to the Welsbach patent of 1885, he considered the Sunlight mantles were within it, in spite of the presence of chromium; and the same would be the case without the chromium. There was no indication that lanthanum could be dispensed with; but one of the methods described a mantle of 60 per cent. of zirconia.

Justice WILLS said he thought it plain that Welsbach considered lanthanum a very important, if not a necessary, part of his combination. He had given alternatives for other things, but not for it. That, however, did not exhaust the question of infringement.

Mr. BOUSFIELD said his friend, in order to succeed, must show that a mantle made of zirconia alone would be an infringement, because the other element—the chromium—was of a different group to any mentioned by Welsbach. It was with a view to this argument, that he was putting these questions.

Cross-examination continued: Witness had tried mantles with zirconia, yttrium, alumina, and lanthana separately. Alumina gave a strong mantle, but no light; zirconia, a fair mantle; lanthana, a very good one; and yttria, not quite so good. In 1885, zirconia was known as an incandescent body; but not the combination of lanthana and zirconia. The addition of lanthana much improved the light. In order and strength, he placed the substances in this order: Alumina, zirconia, yttria, lanthana; the latter being the weakest, but giving the most light. As a rule, one got a better light with any mixture than with a single material. Welsbach suggested the use of magnesia and alumina for the purpose of adding strength. A suitable blend was essential to practical success, in order to satisfy the four conditions named—viz., a large amount of light, the right colour, coherence, and long life in the mantle. He thought a mantle of alumina would be within the specification; but this was a matter of construction. He meant that if one added something to make it sufficiently luminous, or even without that; but there would be no danger of such infringement. Calcium would not stand exposure to the air, as it became carbonized. Lanthana also oxidized to a certain extent. [The learned Counsel then reverted to the subject of the two forms of zirconia, and put some further questions, founded on a specification of Mr. Mackean's in 1889, which gave a process for preparing zirconia in scales, similar to the form in which it was sent out by Mirck.]

Justice WILLS intimated that he could not deal with these intricate chemical questions.

Cross-examination continued: There was no direction in Welsbach's specification to wash the zirconium nitrate. He should wash it in order to purify it.

Re-examined: If he failed, he should attribute it to impurity, and should not be satisfied until he had ascertained the cause. The general impression produced by Dellwik's specification was that he intended the incandescent body to be produced before it was treated with the other solution.

Mr. MOULTON here appealed to his Lordship to say that the evidence in the De Mare case was closed, and not to hear anything further about ammonia.

Justice WILLS said he considered the De Mare case was closed; but he could not limit the defendants in the present case. If any evidence adduced in that case threw a light on the other, he could hardly exclude it.

Mr. BOUSFIELD said the defendants were dependent in this matter on Dr. Hehner, who could not give them his whole time; and he had really not concluded his investigations.

Justice WILLS said this sort of defence did not meet with much judicial sympathy. There was evidently a very valuable invention, which a number of people were trying to prevent the inventor from getting the benefit of. However, he was anxious to prevent any idea that full justice was not done to both sides; and he would allow Mr. Bousfield to add any evidence in the De Mare case up to Wednesday, when that case must be closed. The other action must take its course.

Saturday, March 28.

Mr. MOULTON, at the opening of the proceedings, stated that, having considered the case very carefully with his colleagues, they had determined to withdraw the Haitinger patent from consideration. This would render it unnecessary to go into any differences between Haitinger and Dellwik, and much shorten the case. He did not propose, therefore, to call any further evidence.

Mr. BOUSFIELD was completely taken by surprise; his friend having been kind enough to intimate to him on the previous evening that he proposed to call Professor Dewar this morning. He (Mr. Bousfield) was therefore not as prepared as he should otherwise have been to address the Court, and would probably be obliged to take more time than if he had arranged his materials.

Some conversation ensued as to the desirability of adjourning the case till Monday.

His LORDSHIP said he should be quite willing to do so, if it would not prevent the case being finished on Wednesday—the last day of the sittings. He found that these cases caused him more difficulty than any he had ever tried; and it was such a strain on him that he certainly desired to have them concluded before the Easter holidays.

Ultimately it was arranged that Mr. Bousfield should commence his opening of the defendants' case, but not call evidence, and if necessary defer the conclusion of his speech.

Mr. BOUSFIELD said he did not intend to go again at any length into the construction of the 1885 Welsbach patent; but he had some further observations to make on the state of knowledge at the time—after carefully reading the evidence given in the former case. He submitted that, as to the results to be attained, there were four points to be considered—viz., 1, The amount of light; 2, the colour of the light; 3, the coherence of the mantle; 4, durability. Further, that there was no common knowledge at the date of the patent that substances other than those mentioned, or in proportions materially differing, would give similar results, or would be equivalents. In connection with this question, he referred again to the case of *Heath v. Unwin*, in which the House of Lords laid it down that the use of equivalents not known to be such at the date of the specification would not be within the patent, and would not be an infringement. He submitted that the evidence even of the plaintiffs' witnesses when they came down from generalities to specific details, showed that no one could have said at the time that any particular one of the rare earths—much less chromium, which was in a different category altogether—could have been substituted for lanthanum. He cited, on this point, several long passages from Mr. Swinburne's evidence, and commented on them. Plaintiffs sought to include within the grasp of the specification all the rare earths except cerium and didymium, which they were bound to exclude, because the patentee gave a warning against them. They said that any "Welsbach skeleton," was within the specification. But the question would be, What was a Welsbach skeleton? It was clear that he did not intend any substance which would not give a good result. He only mentioned lanthanum out of the cerium group; but it was sought to include any of the yttria group because of the patentee's ignorance as to which of them would work well, and which would not. The term "rare earths" was a nebulous phrase, to which no definite meaning could be attached.

Justice WILLS thought both sides had used the term "rare earths" as applying to the cerium and yttrium groups.

Mr. TERRELL said that was the plaintiffs' view.

Mr. BOUSFIELD said that would relieve him to some extent, because the defendants used a small proportion of a material which they desired to keep secret, which did not improve the light but did improve the coherence. It was a rare earth; but it did not belong to either of the groups named. He (the learned Counsel) then cited further passages from Mr. Swinburne's evidence, to show that even he did not claim every rare earth as an equivalent. His contention was that when once a departure was made from the substances named, and the equivalents named, there was no definite information given as to what might or might not be used; and therefore if the claim was as large as was now suggested, it would be bad in point of law, as being too vague. Passages from Professor Dewar's evidence were thereupon quoted, with the same object, and a few from Mr. Dugald Clerk's, Sir Henry Roscoe's, and Professor Lewes's evidence were also referred to, but more briefly; and it was submitted that this evidence threw a very important light on the construction of the specification.

The further hearing was then adjourned to Monday.

Charge of Misrepresentation by an Incandescent Gas-Burner Seller.

At the North London Police Court last Wednesday, before Mr. Horace Smith, David William Barnett, an agent, was summoned for obtaining several sums of money from John Jones, dairyman, of Wick Road, Hackney; Albert Edward Organ, a working jeweller, also of Wick Road; and Charles William Fowler, a wine and spirit merchant, of Chatsworth Road, Hackney. Mr. G. H. Young, who prosecuted, said the allegation was that the defendant had represented himself as an agent of the Incandescent Gas-Light Company, and on that representation had induced the prosecutors to purchase burners of inferior quality; but he had supplied the Company's mantles. Mr. Horace Smith asked if the Company had any patent rights over the burners. Mr. Young said they had not over the burners, but they had over the mantles, which were only sold on the express agreement that they were not to be used on any burners other than those supplied by the Company. In the present cases, the complainants had, after warning from the Company, taken down the lights which defendant had fitted; and, as they were thus useless, they considered that he had defrauded

them of their money. The defendant had been already committed for trial from the Guildhall on a similar charge [see *ante*, p. 521]; but it had been arranged with the Judge at the Old Bailey that the trial should not take place until these cases could be proceeded with. The complainants' evidence was that the defendant showed them the Company's price list, and that he fitted the lights they selected, and charged the Company's full price. In cross-examination, they said they were not paid by the Company to prosecute. They did not know that the burners were imitations until they were threatened by the Company. A great saving of gas was effected; and the light appeared to be the same as that of other incandescent burners they had seen. The defendant said the purchasers had had good value for their money; and only four out of the thousands he had supplied had come forward to prosecute. He represented nine different companies. His Worship committed the defendant for trial, but offered to accept one surety in £25 for his appearance.

Gas Consumers and the Working of Automatic Prepayment Meters.

At the Marylebone Police Court last Thursday, Mr. Curtis Bennett had before him two summonses in which householders were sued by The Gaslight and Coke Company for the recovery of £1 4s. and 8s. 10d. respectively for gas supplied. Mr. R. Humphrey, solicitor, supported the summonses. The gas was supplied through automatic prepayment meters; and, to the surprise of the defendants, when the collector called, they were told that a considerable quantity more gas had been burned than was represented by the money in the meter. The Company demanded payment for the alleged excess; and the defendants resisted the demand—saying they were given to understand that the gas could not be used unless they put sufficient money in the meter to cover the cost. They added that several of these meters had been put up, as most of them had proved defective in the automatic arrangement. The Magistrate made orders for the payment of the amounts claimed, with 3s. costs.

Thefts from Automatic Prepayment Meters.

At the Lambeth Police Court, last Wednesday, before Mr. Hopkins, Harold Searse, 17, labourer, was charged with breaking open two automatic prepayment meters at No. 1, Harling Cottages, Harling Street, Camberwell, and stealing therefrom 6s. 6d., the moneys of the South Metropolitan Gas Company. He was further charged with wilfully damaging the meters. The prisoner's parents lived at the address given; and the premises are supplied with gas through meters working on the "penny-in-the-slot" system. On the 12th inst., the prisoner was left alone in the house; and the money boxes of the two meters were afterwards found to have been broken open, and the contents abstracted. As the result of inquiries, a constable arrested the prisoner, who, when told the charge, said he must do something to get a living. Mr. J. Underwood, an official of the Company, informed his Worship that since November 159 meters had been broken open. The Magistrate sentenced the prisoner to three months' hard labour.

Defective Meter Registration.

At the Carmarthen Borough Petty Sessions, on Monday last week, David Rogers was sued, on behalf of the Carmarthen Gas Company, for £1 0s. 3d., for gas consumed. The supply was furnished by the Company through a meter which was the property of the defendant; and as this was found to be out of order, and registering incorrectly during the last two quarters of 1895, an estimate had been made, based on the consumption in corresponding half years, and an account sent in. This estimate defendant disputed as being too high. He expressed his willingness to pay 18s. or 18s. 5d., the amount of the gas bills in the December quarters of previous years. The Mayor (Mr. H. Brunel White) said that, although he had himself paid on an estimate, he did not think such payments could be enforced, as there was nothing to prove the claim, the meter being unreliable. He suggested a mutual settlement. The Clerk remarked that, in his opinion, nothing could be recovered upon the application. Eventually defendant's offer of 18s. was accepted.

The Stockton and Middlesbrough Water Board have accepted a tender of Mr. John Scott, of Cotherstone, for the construction of filter-beds at Larlington, at a cost of £57,041. The lowest tender was £53,146; and the highest, £78,137.

Armagh Gas Company, Limited.—The annual general meeting of this Company was held on the 16th inst.; Mr. J. S. Riggs presiding. The Directors reported that the profits on the past year's working would warrant the payment of the usual dividend of 2s. per share (10 per cent.); and this they recommended. During the severe storm of last winter, they distributed to the poor, through the clergy of the different churches, £21 worth of coke. If the price of coal remains favourable, they hope to reduce the charge for gas to 3s. 9d. per 1000 cubic feet from the 1st of July next. The Engineer and Manager (Mr. J. Whimster) reported that important repairs had been executed to the main retort-house, and to the large gasholder; and that three benches of retorts had been renewed. The automatic prepayment meters which have been introduced appear to be giving satisfaction; and there are now 26 in operation. Since the abolition of meter-rents, the new meters being set to give gas at the same price as to other consumers—viz., 20 cubic feet for 1d.—are found to be a great boon to small shopkeepers and householders. The report was adopted, and the dividend declared. A vote of thanks having been accorded to the Directors, a similar compliment was paid to Mr. Whimster. The Chairman testified to the way in which Mr. Whimster had worked in the interests of the Company. The result of his labours was, he said, shown by the position of the undertaking, which he held was as successful as any in Ireland. Mr. Whimster suitably returned thanks for the confidence reposed in him.

MISCELLANEOUS NEWS.

THE TYNEMOUTH GAS-WORKS HEROES.

Presentation of Medals and Certificates.

In the presence of a distinguished company, assembled in the Tynemouth Town Hall Buildings last Saturday week, Earl PERCY presented two bronze medals and ten certificates on vellum, granted by the Royal Humane Society, to the men who risked their lives in the attempt to save those of their comrades at the lamentable disaster which occurred on Jan. 20 at the works of the Tynemouth Gas Company.

The MAYOR (Alderman Armstrong), in opening the proceedings, remarked that they were met together for the purpose of publicly recognizing and openly expressing their appreciation of the heroic conduct of a number of their townsmen on the occasion of the lamentable accident which recently occurred at the Tynemouth Gas Company's works—an accident which resulted in serious loss of life and injury to person; and, in addition to giving expression to their own admiration of the gallantry of these men, they were to witness the public recognition by the Royal Humane Society of that gallantry embodied in the medals and certificates which Lord Percy had kindly consented to present. He was quite sure that the recipients deserved the honour. They had done a good deed; and this was not a world in which good deeds cost nothing. In this case, it had cost some men their lives; and the noxious fumes of that deadly gas—sulphuretted hydrogen—must of necessity have injured more or less, if not permanently, the constitutions of the survivors; and having received injury in the public interest and in the public service, he felt satisfied that they were as deserving of public recognition and public sympathy, approval, and appreciation as were those men who performed gallant actions, and suffered for them, in connection with the mercantile, the naval, or the military services. They ought, he thought, to feel proud of having such men in their midst; and, as representative of the borough, he embraced the opportunity thus afforded of congratulating them on their gallant efforts.

Earl PERCY, in the course of an eloquent speech, said it would be difficult for him to judge accurately the merits of each individual who might have been engaged in the rescue. He preferred to say that he believed it to be the truth that everyone, in so far as they were able at the moment, did their very utmost, in the most self-denying way possible, to save their fellows from the peril in which they stood. It was, he was sure, a subject of very great regret to all in the district that some of those who sought to sacrifice themselves for their fellows did fall a sacrifice to that deed, and perished in the attempt; and he specially regretted to hear that one whom they might have hoped to honour, and who would have received the same testimony of appreciation for what he had done, was now no more, and could not receive it. There was one other circumstance he could not help alluding to. It was most fortunate that they could look upon this sad event as for all practical purposes purely accidental. He had read with some attention the report of the public inquiry which took place; and he saw it was mentioned that the accident was owing to a valve having been left open. There had been a very slight defect in the working of the valve; and he must confess, speaking of it in that light, he regarded it as a most fortunate circumstance, because, on the one hand, even a slight defect would excuse, he thought, the man who left the valve open, whoever he might be—it would excuse him of any culpable negligence in the act which he was called upon to perform. On the other hand, it was amply proved at the inquiry that the defect was so slight that it did not practically interfere with the proper working of the apparatus, and that, consequently, no blame could be attributed to the Company or the survivors. They might, therefore, look at it as a pure matter of accident. There were none in this world who were exempt from making trivial mistakes; and it often occurred to him that they hardly thought enough of the position in which many workmen were placed by the nature of the trade they pursued. With most of them their mistakes had not, when committed, been attended with any very serious consequences; and more particularly was this the case if the operation or the work they had to carry out was one of an ordinary or routine character. But, in the complex inventions of the present day, and the working of many forms of machinery, a particular action might have to be carried out day after day, as a mere matter of routine—it might be allowable to be considered the most trivial and ordinary act that could be performed; and yet the consequences of any mistake in the act might result in the most serious loss of life and property. It was much to the credit of the working man that so great care was usually exercised in the routine business of his daily life.

His Lordship then made the presentations, as follows: Bronze medals, to William Ray and James Cummings; certificates on vellum, to John Johnson, John Patterson, Joseph Forster, Henry Harrison, Thomas Cook, Joseph Vickers, and Charles Compson. There was also a certificate for William Brown, another of the gas workers, who had rendered valuable service, but who had since died. His Lordship gave each recipient a cordial shake of the hand.

A vote of thanks to Earl Percy, proposed by Alderman J. F. SPENCE, seconded by Mr. J. B. WILLIAMSON (Chairman of the Gas Company), was carried amid hearty applause.

In the report submitted at the annual meeting of the Company last Thursday, the following paragraph appeared: "The Directors deplore the sad accident which occurred at the works on the 20th of January last, by which five men, including the foreman, Mr. Vickers, lost their lives. At the inquiry held before the Coroner, the Company were entirely freed from blame; it being proved that the purifier, where the accident occurred, was one of the most recent and best possible construction. The Directors voted the sum of one hundred guineas to the fund for the relief of the widows and orphans left destitute, and felt sure that their action would meet with the approval of the shareholders." It was also mentioned by the Chairman (Mr. J. B. Williamson) that three claims under the Employers' Liability Act were still pending on account of the accident.

COMMERCIAL GAS COMPANY.

The Half-Yearly Report and Accounts.

The following is the report of the Directors of this Company for the half year ending Dec. 31 last, which, with the accounts for this period, will be presented at the ordinary meeting of the proprietors next Thursday:—

The Directors submit the accounts for the half year ended Dec. 31, 1895. The revenue account shows a net profit for the half year of £43,006 0s. 8d.; making, with £598 18s. received for interest, £43,604 18s. 8d. This, added to the amount brought forward from the previous half year, makes £65,509 3s. 3d. Deducting therefrom £3712 10s. for interest on debenture stock, there remains standing to the credit of the net revenue account a balance of £61,796 13s. 3d. available for dividend. The Directors recommend that dividends be declared at the rates of 13¾ per cent. per annum upon the old stock of the Company, and of 10¾ per cent. per annum upon the new stock, both less income-tax; and that the difference between the declared rates and the authorized rates of 13¾ and 10¾ per cent., having regard to the price charged for gas, be carried to the reserve fund. The balance of the net revenue will be carried forward to the next half year.

The accounts accompanying the report consist of the usual statements. The statement of capital stock (No. 1) stands as before—viz., £715,000 paid up, out of a total £830,000 authorized. The statement of loan capital (No. 2) is also unchanged—£165,000 borrowed, out of £300,000 authorized. The capital account (No. 3) shows receipts to the amount of £880,000, out of which a total of £870,863 had been spent up to June 30, 1895, increased to £877,952 by the expenditure of £7089 (of which £2192 was for new mains, £1513 for new meters and stoves, and £2676 for new coin-meters and fixing), in the six months covered by the report. The unexpended balance at the close of the past half year was £2048. The remaining statements in the accounts (which are signed by Mr. Spencer W. Gore, the Official Auditor) are reproduced in full.

No. 4.—REVENUE ACCOUNT.

To Manufacture of gas—			By Sale of gas—		
Coals, including dues, carriage, unloading, and trimming (see account No. 8)	£67,384 17 6		Common gas, per meter, at 2s. 6d. per 1000 cubic feet	£122,797 6 0	
Salaries of Engineers, Superintendents, and other Officers at works	2,186 16 8		Public lighting and under contracts, common gas	9,552 16 1	
Wages (carbonizing)	19,450 19 11		(See statement No. 10.)		£132,350 2 1
Purification, including £2044 19s. 3d. for labour	4,059 15 1		Meter-rental	£2,101 14 0	
Repairs and maintenance of plant and works, materials and labour (less £146 19s. 3d. received for old materials)	17,820 16 1		Coin meter rental	548 11 5	
	£110,903 5 3		Stove hire	970 9 10	
Distribution of gas—					3,620 15 3
Salaries and wages of Officers (including Rental Clerks)	£1,393 7 0		Residual products—		
Repairs, maintenance, and renewals of mains, service-pipes, and fittings, including labour	3,632 7 9		Coke, less £3720 7s. 0d. for labour	£26,038 6 0	
Repairs and renewals of meters	1,403 4 4		Breeze, less £710 9s. 6d. for do.	334 18 4	
" " stoves	1,077 13 6		Tar	9,080 6 6	
" coin meters and fittings	416 0 0		Ammoniacal liquor and sulphate	4,909 8 7	
	7,922 12 7				40,362 19 5
Public lamps—Lighting and repairing	2,438 12 4		Miscellaneous receipts—		
Rent, rates, and taxes	6,457 18 11		Rents	£357 5 10	
Management—			Transfer fees	22 15 0	
Directors' allowance	£1,250 0 0				380 0 10
Company's Auditors	75 0 0				
Salaries of Secretary, Accountant, and Clerks	1,139 10 0				
Collectors' salaries and commission	1,478 4 4				
Stationery and printing	491 8 10				
General charges	378 19 8				
	4,813 2 10				
Bad debts	836 7 6				
Law charges	133 12 6				
Official Officers	72 5 0				
	£133,607 16 11				
Balance carried to profit and loss net revenue account (No. 5)	43,006 0 8				
	£176,613 17 7				£176,613 17 7

No. 5.—PROFIT AND LOSS (NET REVENUE ACCOUNT).

Interest on debenture stock	£3,712 10 0	Balance, June 30, 1895	£68,585 9 7
Balance available for dividend, carried to balance-sheet	61,796 13 3	Less—Amount of dividend paid for half year ending June 30, 1895, £45,787 10s. Amount available, carried to Reserve Fund, £893 15s.	46,681 5 0
			£21,904 4 7
		Balance from No. 4 account	43,006 0 8
		Dividends and interest balance	598 18 0
	£65,509 3 3		£65,509 3 3

No. 6.—RESERVE FUND.

Balance on Dec. 31, 1895	£40,695 19 6	Balance on June 30, 1895	£39,802 4 6
		Net Revenue Account (No. 5)	893 15 0
	£40,695 19 6		£40,695 19 6

No. 7.—INSURANCE FUND.

Balance on Dec. 31, 1895	£28,652 7 7	Balance on June 30, 1895	£28,652 7 7
	£28,652 7 7		£28,652 7 7

No. 8.—STATEMENT OF COALS.

Description of Coal.	In Store, June 30, 1895.	Received during the Half Year.	Carbonized during the Half Year.	Used and Sold during the Half Year.	In Store, Dec. 31, 1895.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	34,976	106,030	111,272	403	29,331
Cannel	2,006	3,142	904*	—	4,244
	36,982	109,172	112,176	403	33,575

* 141,000 gallons of petroleum spirit and benzol used as substitute for cannel.

No. 9.—STATEMENT OF RESIDUAL PRODUCTS.

——	In Store, June 30, 1895.	Made during the Half Year.	Used during the Half Year.	Sold during the Half Year.	In Store, Dec. 31, 1895.
Coke—tons	4,528	68,151	15,300	46,350	11,029
Breeze—chaldrons	1,850	8,631	—	7,021	3,460
Tar—gallons	247,200	1,160,209	—	1,092,679	314,730
Ammon. liq.—butts of 108 gals.	9,886	37,389	32,357	—	14,868
Sulphate of ammonia—tons	1,724	1,037[10]	—	1,160[10]	1,601

No. 10.—STATEMENT OF GAS MADE, SOLD, ETC.

Description of Gas.	Quantity Made, Meter Register.	Quantity Sold.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lights.
		Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	1,146,973	59,983	982,378	1,042,361	15,393	1,057,754	89,219	5,455

BALANCE-SHEET.

To Capital—		By Cash at Bankers	£6,026 15 4
For balance, per account No. 3	£2,048 9 3	Cash in hand for current expenditure	3,000 0 0
Net Revenue—		Amount invested in Consols	66,667 2 1
For balance, per account No. 5	61,796 13 3	Stores in hand—	
Reserve Fund—		Coals	£21,288 8 0
For balance, per account No. 6	40,695 19 6	Coke and breeze	6,049 14 6
Insurance Fund—		Tar, sulphate, and ammoniacal liquor	20,400 12 7
For balance, per account No. 7	28,652 7 7	Sundries	11,851 5 6
Dividends outstanding	2,149 2 7		59,590 0 7
Deposits	9,984 7 6	Accounts due to the Company—	
Interest on debenture stock	223 15 0	Gas-rental, quarter ending Dec. 31, 1895	£81,578 2 2
Sundry tradesmen and others, for amount due for coals, stores, and sundries	20,660 1 3	Arrears outstanding	1,418 0 7
Loan from bankers	60,000 0 0		82,996 2 9
		For coke and other residual products	£7,191 13 7
		Sundries	739 1 7
			7,930 15 2
	£226,210 15 11		£226,210 15 11

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly Report and Accounts.

In their report for the half year ending Dec. 31 last, which the Directors of the above Company will present to the proprietors to-day, they state that the result of the working was gross receipts amounting to £140,798; while the expenditure, including £5036 interest paid on the debenture loan, &c., was £99,927—leaving a net profit of £40,871. To this sum is to be added £425 brought forward from the last account; making a total sum of £41,296. The Directors recommend dividends at the rate of 10½ and 7½ per cent. per annum, on the respective shares, after payment of which a balance of £7728 will remain. Of this sum, they propose to add £2500 to the contingent account, and to carry the balance (£5228) forward to the next account, to meet any reduction which may arise owing to the price of gas having been lowered since the beginning of the present quarter. Reference is made to the fact that the Corporation of Dublin have promoted a Bill in Parliament, some of the clauses of which relate to the Company; and the Directors have, of course, taken the necessary steps to protect the proprietors' interests when the Bill comes before a Parliamentary Committee. They express regret that the market for residuals is still depressed; the receipts for coke and sulphate of ammonia showing a falling off of £5139 compared with the corresponding period of 1894. The works and plant have been maintained in a state of efficiency.

The accounts show that the expenditure for capital purposes has been increased by £1959, the bulk of it for new mains, service-pipes, and meters; bringing up the total outlay to £946,219, out of £949,996 raised. The sale of gas produced £115,522; meter-rental, £3053; residuals, £22,047; and rents and transfer fees' made up a total of £140,798. The expenditure on the manufacture of gas in the six months covered by the accounts was £72,341, of which £48,972 was for coal, cannel, and oil; distribution cost £8120; management, £5001; and miscellaneous charges brought up the total to £91,891—leaving a balance of £45,907. There were 55,487 tons of coal and 10,440 tons of cannel (in addition to oil spirit) carbonized in the half year; and 692,616,000 cubic feet of gas were made, of which 632,640,000 cubic feet were accounted for. The quantities of residuals produced are estimated as follows: Coke, 79,639 chaldrons; breeze, 10,481 chaldrons; tar, 947,890 gallons; and ammoniacal liquor, 1,400,945 gallons.

SAN PAULO GAS COMPANY, LIMITED.

The Ordinary Meeting of this Company was held last Wednesday, at Winchester House, Old Broad Street, E.C.—Mr. D. M. Fox, M.Inst.C.E., in the chair.

The Secretary (Mr. G. Rogers) read the notice calling the meeting; and the report and accounts for the half year ending Dec. 31 last were taken as read.

The Chairman, in moving the adoption of the report, first referred, in feeling terms, to the loss the Company had sustained in the death of Mr. F. Delmar, who had been Chairman since the inauguration of the concern in 1869. Turning to the accounts, he said it would be found that the net result (including £2302 brought forward) was a balance of £12,759, which was about the same as in the corresponding half of 1894, in spite of the very heavy charges they had had to make on revenue account. The shareholders would be glad to find that the Directors were able to recommend a dividend for the half year which would make 8 per cent. for the year. In 1894, the dividend was 7 per cent.; in 1893, 5½ per cent.; in 1892, it was 2½ per cent.; while in 1891, there was practically a loss. Previous to that, they had a long career of 10 per cent. dividends; but events happened in Brazil—the depreciation of currency and other matters—which brought the Company into low water in 1890 and 1891. Regarding the business of the half year, he quoted some comparative figures that had been prepared for him by the Consulting Engineer (Mr. A. F. Phillips). The sale of gas in the six months amounted to 66,793,000 cubic feet, as against 64,259,000 cubic feet in the corresponding period of 1894. Taking the whole year, the consumption was 133,259,000 cubic feet, as against 124,576,000 cubic feet in 1894, which was an increase of 7 per cent. The increase in the half year compared with the second half of 1894 was 2,534,000 cubic feet, which was about 4 per cent. The increase in the receipts for gas was equal in currency to 5 per cent.; but in sterling there was a decrease of £503. As the shareholders were aware, both the public and private lighting was under a sterling contract. But it was a question whether it was politic to charge the sterling rate to the private consumers. Therefore, the Directors, in their discretion, reduced the rate; and consequently there was a decrease on the private lighting. On the public lighting, however, they always charged up to the maximum. On coke and tar, they had a gain of £228; and coal had cost £3428 less. The balance of profit was £13,801, which was £70 more than in the second half of 1894. Coke and tar had realized in the year an additional £1347; and coal had cost £5314 less. Coke would have realized more; but they had to reduce the price, as a matter of policy, in order to get rid of a considerable quantity which had been allowed to accumulate in past years. They were now, however, getting back to their regular scale of charges. The number of public lamps had increased from 2225 to 2422; and the private consumers, from 5272 to 5370. Regarding the latter figures, he said the actual increase was considerably more than 98, because they had removed many meters which had been left in houses where gas was not now used. Notwithstanding this extension of their business, no addition had been made to the capital expenditure during the whole of the year. The net profit remaining on the revenue account, after paying all charges, was £2235 in excess of what it was in the previous year; and this he thought the shareholders would consider was satisfactory and substantial progress. Having borne testimony to the energy that was being displayed by the new officials in San Paulo, the Chairman directed attention to the following paragraph in the report: "The valuation of the Company's plant, antecedent to the call for tenders for the service of lighting the city by gas, at the expiration of the Company's concession, has been completed. The official award of the valuers fixes the amount at £341,377 14s. 7d. in gold." Explaining this, he said that the concession dated back to 1863; but, owing, he supposed, to difficulties in raising money on this side, the Company was not formed until 1869, and the lighting was not in operation until 1872. The concession was for 25 years; but there was some question as to the date of its termination. The Government argued on their side (and, he thought, with some reason) that the expiration dated from the signing of the contract. The Company contended that it dated from the lighting of the city by gas in 1872. In 1886, a provincial law was passed authorizing the calling of tenders for lighting by gas at the expiration of the contract. Then came a revolution and other delays; and no one then paid any attention to the new concession. But in 1894, a law was again passed; and both in this and that of 1886, there was a clause providing that, in calling for tenders, there should previously be a valuation of the Company's property, because, at the expiration of the contract, it did not revert to the Government. They had since entered into an arrangement with the Government by which the concession would continue in force until Oct. 15, 1897; so that in this way they had obtained the full period for which the Company had contended. The valuation of £341,377 was a fair one; and the floating assets—such as coal and stores—the reserve account and anything that was not expenditure of capital, and also the extensions made subsequent to the valuation, would all be added. These would make the amount something like £400,000; and this someone would have to pay if the Company were not successful with their tender. The valuation had been made by eminent experts in San Paulo, to whom the Company were indebted. He then referred to the illness of the late Secretary (Mr. J. Heath), who, he said, had been a good servant for a long series of years. His illness (which was a hopeless one) had culminated in paralysis of the brain; and he was at present in a private asylum. The Directors felt sure they were following the wish of the shareholders by doing something towards his comfort and treatment; and this they proposed to continue.

Dr. E. Batt seconded the motion.

Inquiries were made as to two or three items in the accounts; and the speakers all congratulated the Directors upon the improved state of the Company's affairs.

The motion was unanimously carried.

A dividend of 4½ per cent. for the half year (making 8 per cent. for the year) was then declared.

The election of Mr. John Barker as a Director was confirmed; the Chairman was re-elected; and Messrs. Cash, Stone, and Co. were appointed Auditors.

A cordial vote of thanks to the Chairman and Directors terminated the proceedings.

TORQUAY GAS COMPANY.

The Annual General Meeting of the Torquay Gas Company was held on Friday, the 20th inst.—Mr. W. H. Kitson presiding.

The Directors' report showed the total receipts on revenue account to have been £25,637 14s.; and the expenditure, £20,597 17s. 4d.—leaving a balance of £5039 16s. 8d. to be carried to the profit and loss account. They recommend the declaration of the full year's dividend at the rate of 10 and 7 per cent. The gas-rental showed an upward tendency, notwithstanding the reduction in the price since June last. Residuals, except tar, had been declining throughout the year; sulphate of ammonia having touched the lowest figure on record. The new gasholder has been completed; and a new retort-house built, and fitted with regenerative furnaces and manual stoking machinery.

The Chairman, in moving the adoption of the report and accounts, congratulated the shareholders on the position and prospects of the Company. He said the receipts had been £25,637, as compared with £25,710 in the previous year; the expenditure, £20,597, against £18,312; and the balance of profit was £5039, against £7308. The reduction was due to the fact that a considerable proportion of the profits had been expended on the new gasholder and manufacturing machinery. There had also been a lowering of the price of gas; and the consumers might look forward to a time not far distant when there would be a still further reduction. At the sale of shares last June, the price realized—£16 5s.—was the highest ever received for their £10 shares. It would be necessary before long to issue more capital, to reduce the balance of £2596 due to the Treasurer on capital account, and to carry out further alterations. As regards the revenue account, the cost of coal had increased by £600; repairs and maintenance of works, by £1700; and renewing and fixing meters, £150; while the cost of management had been decreased by £38, and bad debts by £16. The receipts from the sale of gas showed an increase of £560; and but for the reduction in price, there would have been a total increase of about £1300. It was hoped that more cooking-stoves would be used when the automatic prepayment meters were introduced. When Mr. Beynon was appointed Manager of the works ten years ago, the paid-up capital of the undertaking was £76,519; while now it was £100,873. The amount then realized per ton of coal carbonized was £7 3s. 7d., whereas it was now £6 16s.; and per 1000 feet of gas sold, 17s. then and 15s. 11d. now. The number of tons of coal carbonized had increased from 10,669 to 14,833; and gas sold, from 89,491,000 to 126,438,000 cubic feet. With regard to the agitation in connection with the introduction of the electric light, the Directors had very properly decided not to take any active part at present, collectively or individually, in any opposition which the ratepayers might think fit to make; but this would not prevent their opinions, or those of the shareholders, being made known as ratepayers, and as people interested in the welfare of the town. For his own part, he hoped the authorities would pause, and very seriously consider, before embarking upon such a heavy and doubtful experiment. He believed that there was room for both gas and electricity in Torquay, and that the electric light might help gas. The Company would naturally not object to it if it had this effect.

Mr. W. Ball seconded the motion; and it was agreed to.

ILFRACOMBE GAS COMPANY.

The Annual Meeting of this Company was held last Wednesday—Mr. T. D. Wivell presiding. The report of the Directors stated that, after meeting the parliamentary expenses in connection with the promotion of the Company's Bill of 1895, the remaining profit for the year was insufficient to pay the usual dividends. The Directors, therefore, proposed to take £550 from the reserve fund for the purpose of making up 10 per cent. on the "A" shares, 7 per cent. on the "B" shares, and 4 per cent. on the "C" shares. The price of gas was reduced 3d. per 1000 cubic feet to all consumers on Sept. 29 last. During the year, 28 ordinary and 111 prepayment meters had been fixed, and 32 cooking-stoves lent on hire. The make of gas increased by 3,385,400 cubic feet; and the production for the year was 33,994,600 cubic feet. As to the Bill which was being promoted in this session, the Directors reported that it had passed the second reading in the House of Commons; and as it was unopposed, they had every confidence that it would pass into law without further difficulty.* The Chairman, in moving the adoption of the report, congratulated the shareholders on the eminently satisfactory position of the concern. The growth in the consumption of gas had, he said, very considerably increased, especially with respect to cooking-stoves, which were appreciated more and more in Ilfracombe as their convenience and economy became better known. Upwards of 260 automatic prepayment meters had been fixed, and not one discontinued. Though the unfortunate Bill of last year cost the Company upwards of £2000, the little differences between the District Council and the Directors had since been adjusted in a very friendly spirit at a conference. Mr. S. Day seconded the motion, which was supported by Mr. H. F. Willey, who eulogized the policy of the Directors. The motion was carried. The retiring Director and Auditor were re-elected, and the Directors thanked for their services, as was also Mr. C. E. Ball, the Manager and Secretary.

SOUTH MOLTON GAS SUPPLY.

Local Government Inquiry.

An inquiry with reference to the application of the South Molton Corporation for a Provisional Order to enable them to purchase the undertaking of the South Molton Gas Company was recently held by Major-General PHIPPS-CAREY, R.E., of the Local Government Board.

The TOWN CLERK (Mr. R. L. Riccard), in explaining the case of the Corporation, said the present Gas Company was a private one formed in 1839, and had 26 shareholders. The total share capital was £3300, in 220 shares of £10 each, and 220 "A" shares of £5 each. The works had been leased for many years to Mr. William Oram, who had lately died, and his representatives held the interest until the 24th of June next, when the lease would expire. The rent reserved by the lease was £228; and the lessee also paid £18 per annum as interest on outlay for improvements—making the gross rent £246. He also paid the rates and taxes, and had to keep the works and plant in repair. The site of the works comprised about 12 perches of land, and was adjoined by land belonging to the Corporation. The works were originally built in 1839; but they had been renewed many times. At present, the price of gas was 5s. per 1000 cubic feet. When the Company was formed, it was 12s.; and it had been at different times 10s. 6d., 7s. 6d., and 6s. 8d. The Corporation paid about £220 per annum for the lighting of the public lamps; being at the rate of £2 6s. per lamp. The net average profit of the Company was £234; and for more than twelve years a dividend of 6 per cent. had been paid, and a reserve fund of £185 set aside. Mr. Willey, of Exeter, had valued the works; and he advised that they were in good condition, and could be carried on at a profit at a reduced rate to consumers. The Company offered the works to the Corporation for £3300, which was only fourteen years' purchase of the average profits; and a provisional agreement for the sale had received the sanction of all but two shareholders, representing eleven shares.

Mr. *A. Braddick*, the Manager of the works, gave some particulars as to the plant. He said the make of gas in recent years had been about 4 million cubic feet per annum, and the capacity of the works was 6 million cubic feet.

It was stated that the Great Western Railway Company, who work the Devon and Somerset line, had lodged a petition with a view to obtaining protective clauses.

The INSPECTOR said he did not know why they should want protection which they did not have against the Company. Gas could not be conveyed to the station, which was much below the level of the works. Still, if the Company required protection, they could appear before the Parliamentary Committee, and argue the matter.

The TOWN CLERK said the Corporation would not offer any objection to the clauses, if the Committee thought them necessary.

With regard to the date of transfer, the Inspector thought this should be later than the 24th of June, as they would not get the Order by then. It was explained by the Town Clerk that the Corporation were to pay 5 per cent. on the purchase-money from June 24 until the purchase was completed; and that, as the lessee had recently died, there was a desire to close the matter as early as possible. It was agreed that no profit should be taken from the undertaking until the price of gas had been reduced to 4s. 7d. per 1000 cubic feet.

The South Lincolnshire Fen Water Company are negotiating for the purchase of the Spalding Water Company's works. The Fen Company was formed for the purpose of supplying the towns and villages between Spalding and Sutton Bridge with water.

Goole Gas and Water Department.—A statement of the accounts of the gas and water undertakings of the Goole District Council has been published. The amount transferred to profit and loss account on gas was £4318, and on the water account £1822. After the repayment of principal and interest, and other expenses, there remains a net profit of £2825.

* It will be seen by our "Parliamentary Intelligence" that the Bill has passed through Committee, and been reported.—ED. J.G.L.

GAS AND ELECTRIC LIGHTING IN MASSACHUSETTS.

We learn from the eleventh annual report of the Board of Gas and Electric Light Commissioners of the Commonwealth of Massachusetts, a copy of which has just been forwarded to us by the Chairman, the Mr. Forrest E. Barker, that there were at the commencement of present year 131 corporations and 12 towns under the supervision of the Board. Of the former, 47 are engaged in the supply of gas only; 24 supply both gas and electric light; and 60 provide the latter kind of light only. Of the towns, two have plants for furnishing both gas and electric light; while the remainder supply no other than the latter illuminant. During the past year, eleven companies were chartered with gas or electric lighting powers. In October, the Boston Gas Company started their coal-gas plant; and they have since distributed a mixed coal and water gas without making any reduction in the illuminating power. Water gas, either alone or in combination with coal gas, is distributed by nineteen companies. The accounts of the various undertakings are made up to the 30th of June each year. The total receipts for the twelve months ending June 30, 1895, were $5,280,887, as compared with $5,042,868 in the preceding similar period. Of these amounts, $4,779,821 and $4,500,605 represent the value of the gas sold by meter. The former is an increase of $279,216; whereas in 1893-4, there was a decrease of $938,697, attributable to the large reduction in price by the Boston Companies, and to the general financial depression. The increase for 1894-5 is the largest recorded in any year since the returns have been made, and is due to an augmented output by most of the companies. The receipts for gas supplied to the public lamps dropped to $187,874, from $211,727 in 1893-4—a difference of $23,853, and nearly all attributable to Boston. Those for coke sold fell from $191,388 to $168,235; and for tar, from $113,731 to $107,958. On the other hand, ammoniacal liquor produced $22,600, as compared with $14,857. The expenses total up to $3,770,751, against $3,633,354 in 1893-4; leaving an apparent net profit of $1,510,136. This was increased by interest, rents, and profits from electric lighting to $1,776,986. But the interest on bonds and loans, dividends, and other items, required a sum of $2,063,935; so that there was a deficit for the year of $286,949. Two of the companies did not meet their current expenses; and others did not earn enough to warrant the declaration of a dividend. Thirteen of the companies lowered their charges in the year reported upon. The average price paid by consumers for coal gas to the companies selling annually more than 30 million cubic feet each is $1·03 per 1000 cubic feet. Excluding the Boston and Bay State Companies, it is $1·23. The average price received by the remainder of the coal-gas companies from sales by meter is $1·74; making an all-round figure of $1·10 per 1000 cubic feet. In 1886, it was $1·72. The average price for oil gas is $3·30.

The report contains as usual full particulars as to the manufacturing operations of the companies; but it may be of greatest interest to extract those relating to water gas, which may be best given in tabular form:—

Company.	Process.	Quantity of Material Used in Generator.	Quantity of Enricher Used.	Quantity of Water Gas Made.
		Tons.	Gallons.	Cubic Feet.
Amesbury	Lowe-Granger	285	30,467	6,237,500
Athol	Do.	171	22,805	4,200,400
Bay State	Flannery & Lowe	18,463	383,418	887,878,000
Boston	Wilkinson	7,023	2,460,548	556,330,000
Brookline	Imp. Jerzmanowksi	4,699	2,578,560	413,713,000
Charlestown	Granger	835	195,769	36,471,000
Chicopee	Improved Lowe	249	44,080	10,170,200
Citizens'	Kendall	..	7,300	673,000
Cottage City	Loomis	67	500	3,381,700
Fall River	Lowe	1,081	307,536	63,260,900
Framingham	Loomis	418	..	14,453,000
Haverhill	Wilkinson	903	382,148	75,105,000
Lawrence	Improved Lowe	562	113,193	25,048,658
Lowell	Do.	2,165	651,882	123,121,000
Lynn	Do.	831	219,821	43,450,400
New Bedford	Do.	447	76,729	19,454,800
Pittsfield	Do.	448	79,728	14,188,000
Spencer	Evans	131	71,302	7 893,900
Waltham	Kendall	—	134,370	13,400,100
Worcester	Lowe	3,282	342,546	94,835,000

The raw material used is in most cases anthracite; the enricher being generally naphtha. At Bay State, 99 tons of the solid material were screenings. At Framingham, Cumberland coal was employed. At Lawrence, 19,246 bushels (say, 385 tons) of coke were used; and at Lynn, 18,540 bushels, or about 371 tons. At Worcester, the materials were coal and coke in the proportions of 381 tons and 145,056 bushels; while the Citizens' and Waltham Companies employed naphtha for both generating and enriching. At Charlestown, gas oil was used to the extent of 24,467 gallons; at Cottage City, the enricher was Lima oil; and at Fall River, crude oil to the amount of 289,179 gallons, and 18,357 gallons of gas oil, made up the quantity given of enriching material. At Cottage City and at Framingham, the gas produced was non-illuminating.

There are nine companies who supply oil gas. In its production, five of them use naphtha; two, petroleum; and two, gas oil. The fuel used is anthracite, coal, coke, and wood.

As to the quality of the gas supplied under the supervision of the Commissioners, the law provides that when the gas is found on three consecutive inspections to be of less than 16-candle power, or to contain more than 20 grains of sulphur or 10 grains of ammonia per 100 cubic feet, or any sulphuretted hydrogen, the Company sending it out shall pay a fine of $100 to the city or town supplied. During the five years ending June, 1895, the number of deficiencies in respect of illuminating power were only 12. The excesses of sulphur impurity in this period were 11; and of ammonia, 54—sulphuretted hydrogen being present on 36 occasions. The average illuminating power

(excluding the oil-gas companies) in the five years was 18·13, 19·25, 19·80, 19·29, and 19·34 candles; the average amount of sulphur, 9·53, 9·46, 8·32, 9·45, and 9·27 grains; and the average quantity of ammonia, 3·42, 2·5, 2·24, 2·7, and 2·58 grains. The average illuminating power of the oil gas in the five years was 33·62, 33·50, 32·34, 31·47, and 33·91 candles.

With regard to electric lighting, the following figures show the results of the operation of the central stations in the State for the year ending June, 1895: Receipts for light and power, $3,794,060; from other sources, $28,136—total, $3,822,196. For the preceding year, the total was $3,649,457. The expenses last year amounted to $2,542,133; leaving a balance of $1,280,063, of which the sum of $204,028 was made by gas companies in their electrical departments. The electric light companies therefore made a profit of $1,076,035. Adding the income from rent, jobbing, &c., $151,774, there is shown a total of $1,227,809, against which have to be placed the charges for interest, dividends, depreciation, &c., amounting to $1,410,058. So that there was a deficit of $182,249 at the close of the past financial year, as compared with a surplus of $51,275 in 1893-4. Six of the companies appear not to have earned their expenses; while 33 others did not make sufficient to warrant the declaration of a dividend. The gross profits of the companies doing only an electric lighting business increased last year by $137,763; and although interest and dividend charges decreased, greater depreciation and miscellaneous charges caused the deficit. In 1893-4, the item of depreciation was $151,388; whereas last year it was $565,287. Miscellaneous items, in the first-named period, came to $71,783; last year, to $123,177.

The report furnishes, as usual, an account of the administrative and judicial work of the Commissioners, and also of the accidents resulting in death or bodily injury, from gas or electricity, which were officially notified to them. There were twenty-five deaths from gas, and three from electricity. Eight of the former had the appearance of deliberate suicide; the remainder being due to ignorance, accident, or carelessness. There were thirty cases of bodily injury from gas, and twenty from electricity; five of the former being apparent attempts at suicide. From a remark made by the Commissioners, it is to be feared that the above figures do not comprise the whole of the casualties; for it appears that a large number of the companies disregard the law as to reporting accidents which occur in connection with their plant. A suggestion is made as to imposing a suitable penalty for failure in this respect.

LEEDS CORPORATION GAS SUPPLY.

Half-Yearly Accounts.

The Superintendent of the Leeds Corporation Gas-Works (Mr. R. H. Townsley) has prepared a report upon the financial results of the working of the department during the six months ending Dec. 31 last. The net profit was £17,756, as compared with £16,650 during the corresponding period of 1894. By the sale of gas, there was an increase in the revenue of £9883. Coke realized £583 more; and there was an advance of £483 in the receipts from tar. On the other hand, there was a decrease of £5102 in the amount received for ammoniacal liquor. In the expenditure on coal, there was an increase of £1069; and on wages, £2208. There was also an additional £1385 expended on repairs to retorts, gasholders, &c. Taking into account every item of income and expenditure, the total amount of increased expenditure and decreased revenue in the half year, as contrasted with the corresponding period of 1894, was £10,404; while various items of decreased expenditure and increased income amounted to £11,510. These figures show an improvement for the last half year of £1106—the difference, in fact, between £17,756 and £16,650. Although at a recent meeting of the Council, Mr. Lowden, the Chairman of the Gas Committee, said he anticipated that at the end of the present year the Committee would have a surplus, it may be pointed out that a resolution of the Council reducing the price of gas 2d. per 1000 cubic feet to consumers, came into force on Jan. 1 of the present year. This, it is estimated, will diminish the receipts of the Committee by something like £19,000 a year. The Lamp Committee are also seeking to reduce the Committee's income. At a meeting of that body last week, it was resolved to request the Gas Committee to supply gas for the lighting of the streets at 6d. per 1000 cubic feet. This was the price which the Lamp Committee were charged up to about ten years ago, when the Gas Committee determined to treat them as ordinary consumers, and accordingly made them pay 1s. 10d.—the same as the inhabitants were then paying. Since then the gas used for lighting the streets has been charged for at the same rate as that paid by the ordinary consumers; and last year the Committee had to hand to the Gas Committee about £17,000.

HUDDERSFIELD CORPORATION GAS DEPARTMENT.

The Charges for Re-construction of Works.

The Borough Accountant of Huddersfield recently called the attention of the Gas Committee to the subject of the adverse balance on the gas-works account, consequent upon the works of re-construction which have been carried out; and he asked how they proposed to deal therewith. A Sub-Committee was appointed to consider, with the Borough Accountant and the Gas Engineer, the items expended on the re-construction, with a view to deciding upon the amounts that were properly chargeable to capital and revenue accounts respectively. The Committee at a subsequent meeting further discussed the subject, and resolved that £25,000 of the amount expended should be charged to capital account. At the last meeting of the Borough Council, Alderman Stocks moved that the minutes of the Committee be adopted, eliminating the reference in them to the suggestion that £25,000 be charged to capital account. He stated that in Committee he had given a full explanation of the different courses they could adopt. One was by rate-in-aid, and the other was to leave the debt over, and to pay it back out of profits. He was in favour of the latter mode. The Committee in their wisdom thought proper to adopt the rate-in-aid; but he did not vote for it, for he believed it would be better to increase the capital. The Finance Committee favoured the rate-in-aid; and he would rather adopt that course than have a heavy rate-in-aid in future. He, however, felt fully convinced that they had works which would give an excellent return to the Corporation in years to come, if Huddersfield possessed good trade. He had no doubt they had a splendid investment; and he was certain that in a few years they would neither have to ask for a rate-in-aid, nor have any capital hung up. He was quite satisfied that one of the best things the Gas Committee could do was to have a reserve fund; for, if they had not, they could scarcely tell where they would be landed, because the plant was continually wearing out. Mr. Crosland seconded the motion. Mr. Shaw hoped that before another year passed an actuary would be employed to go through the facts and figures which had been obtained, and frame a scheme which should guide them in their future management of the works; and if, at the end of the year, they found that the income was not sufficient to allow a proper depreciation, he would continue the rate-in-aid for a few years until the gas undertaking was able, by its own recuperative power, to do without it. He thought they were adopting a wise plan in putting the £25,000 on one side, and taking time for consideration. The motion was adopted.

ELECTRIC LIGHTING NOTES.

At intervals since June, 1894, the question of the Corporation purchasing the property of the Electric Lighting Company has been raised at Southampton. In December of that year, the former body obtained the insertion in a Provisional Order that the Company were then promoting of clauses giving them certain powers in the matter Arrangements were arrived at by which the Corporation were allowed twelve months in which to consider the course they should take. The Works Committee were charged with the duty of looking into the question; and they sought the advice of Mr. Manville, who reported in favour of purchase. Negotiations have since been actively proceeding; the outcome being the submission of a recommendation by the Committee at the last meeting of the Council that the undertaking be purchased for £21,000. This sum is to include all preliminary expenses, goodwill, Licence, and Provisional Order, and the cost for charges and expenses to be incurred in winding up the Company and vesting the undertaking in the Corporation. They are to take at a valuation the stock of stores, and to reimburse the Company the small amount of capital expenditure since Dec 31 last, and to take over the existing contracts for stores, coal, &c. The Committee also recommended that application be made to the Local Government Board for a loan of £50,000 to complete the purchase, and to carry out the necessary extensions of the undertaking. The report and recommendation were placed before the members by Mr. Lemon, who dilated upon the advantages which would accrue to the Corporation by the purchase. Among these, he submitted that the cost of lighting the streets would be reduced if electric lighting was substituted for gas, "providing they had judicious management." The estimated cost of the public lighting for the present year is £4846; and he held that it was incumbent upon the Council to take any step which would decrease this "vast" expenditure. It is evident by these remarks that Mr. Lemon is of opinion that a substantial reduction is possible; and therefore his precautionary observation as to "judicious management" throws upon those who will have the direction of the undertaking the responsibility of securing for the ratepayers a considerable curtailment of expenditure in this respect for an equal amount of illumination. Discussion was generally favourable to the proposals, which were adopted by 29 votes to 4, with 8 members neutral.

Mr. Herbert Tulloch held an inquiry at Sunderland on the 20th inst. respecting an application by the Town Council for the sanction of the Local Government Board to the borrowing of £16,000 for the purposes of electric lighting. It was explained to him by the Town Clerk that the Council have already borrowed £25,000 in connection with the scheme. Alderman Bruce acknowledged that they had keen competition in the neighbourhood with gas, the charges for which ranged from 1s. 6d. to 2s. per 1000 cubic feet.

The Lighting Committee of the Peterborough City Council last Tuesday considered the question of carrying out an installation of electric lighting; but they decided, before coming to a definite conclusion, to send out circulars to the ratepayers in the suggested area of supply, to ascertain the number of lamps likely to be connected. We learn from a report of the proceedings to hand that a communication from the Gas Company provided a little amusement for some of the members. The Company offered to light the principal streets in the centre of the city with incandescent gas-lamps; but, as the outlay on their part would be £200, they asked the Council to agree to a contract for a period of years for the lighting of these streets, so as to recoup them for their expenditure. The suggestion of the Company, however, did not find much favour. It was remarked by Alderman Barford that he was sorry the Company had not shown a desire to improve the lighting before they were forced to by the agitation for electric light. It was resolved that a contract should not be entered into.

Mr. Robert Hammond, the Consulting Electrical Engineer of the Coventry Corporation, has prepared a report upon their electric lighting undertaking, in which, after setting forth that the present plant is insufficient for the demands likely to be made upon it, he suggests the laying down of new plant of sufficient capacity to provide for the maintenance of an efficient reserve, and to be prepared to cope with any forthcoming large demand. The estimated cost of the additions he proposes, with the necessary cables, &c., would be £8900. By this expenditure, the works would have a total capacity of 350 kilowatts (permitting 17,500 lamps to be connected), as compared with 153 kilowatts (7500 lamps) at present. The capacity; after deducting reserve, would be 150 kilowatts (5000 lamps), as compared with 50 kilowatts (2500 lamps) at the present time. It will be seen, says Mr. Hammond, that, by an expenditure of 37½ per cent., the total capacity of the works can be increased by 133 per cent., and the actual working capacity by 200 per cent.

Major Cardew conducted an inquiry at Huyton, last Thursday, into an application by the British Insulated Wire Company, of Prescot, for a Provisional Order to supply with electricity the districts of Huyton-with-Roby, Whiston, Rainhill, and Eccleston. Mr. Sydney Morse, for the Company, stated that this was the second application. They supplied electricity for public and private lighting in Prescot; and, having laid down a considerable plant, they sought to extend the mains to the districts mentioned. They were prepared to lay out £10,000 at once, without risk or cost to the ratepayers, to give them the benefit of the light if they wished for it. Mr. A. G. Steel, on behalf of the Huyton and Whiston Councils, objected to the granting of the application on the ground that no alteration had taken place since the first application was refused; and the evidence was weak and flimsy, and not sufficient to warrant the consent of the local authorities. When a *bonâ fide* expression of desire for electricity was manifested, the Councils would take into consideration the advisability of applying for an Order themselves. Witnesses were called on both sides.

A Committee of the whole of the Folkestone Town Council have rejected a motion that the Corporation should carry out the powers they possess under their Electric Lighting Order, at a cost not exceeding £20,000; and they have decided to transfer the powers to a company, on terms to be arranged. It is generally felt that this resolution means indefinite postponement of the introduction of the electric light; there not being any exceptional inducements for a private company to compete with the Gas Company at the present time.

The electric lamps in the streets of Tunbridge Wells could not be lighted last Tuesday; and the result was that the Gas Company had to be asked to light the gas-lamps, which, fortunately for the inhabitants, and especially pedestrians, had not been removed.

A member of the Hampstead Vestry bitterly complained, at last Thursday's meeting, of the vagaries of the electric light. This gentleman had, in his wisdom, done away with all the gas connections at his residence, and installed the Vestry's illuminant instead. But his faith was sadly undermined when he found himself without light for a whole day last week. If such a thing occurred again, he wailed, "I shall certainly require compensation." This did not complete the list of disasters; for several members asked the Engineer why the current was shut off along Haverstock Hill on Saturday night. But the official admitted that the current was not voluntarily shut off, but was off in consequence of a breakdown of the low-tension cable, owing, he thought, to the shortness of the fuse. In the Finchley Road, too, the arc lamps were nearly out on another occasion; but the Engineer had never heard of anything so dreadful. After a little more "heckling" of this unfortunate official, Mr. Johnson inquired when the long-promised "Statement of the Electricity Department" was to be presented to the ratepayers; and he commented on the extraordinary delay. The Vestry Clerk replied that the return was practically ready; and he was only waiting for one item relating to the establishment charges. He hoped to have this by next week. As an instance of the determination of the Electric Lighting Committee to push the sale of their commodity at any cost, it may be mentioned that it was decided "that mains for the supply of electric light to private customers be laid" in certain roads, from one of which only a single application for current had been received. Mr. Johnson thought that the Committee "were going to work in a peculiar manner." And who shall say him nay?

An interesting experiment in electric lighting was inaugurated at Mevagissey last Wednesday. This little Cornish town, with a population of about 2300, has hitherto had no system of public lighting. The Parish Council, however, took the matter up last year; and as the result an Electric Lighting Company was formed, with a capital of £1500. The Company have entered into a contract to light the streets for £48 per annum; and they will also light the harbour and pier head. The plant consists of a semi-portable engine of 12-horse power nominal capacity, a dynamo of 200 ampères of 130 volts capacity, and a set of accumulators consisting of 60 Epstein cells; with a storage capacity of 360 ampère-hours. Thirty-two 16-candle power and two 32-candle power lamps are used to light the streets; and on the harbour and piers there will be one 100-candle power and eleven 16-candle power lamps. The mains have a capacity of 400 16-candle power lamps; but so far there are no private consumers, though some will be found in the local places of worship and the village shops. By the use of accumulators, it is anticipated that it will only be necessary to work the engine and dynamo twice a week. The lighting of the streets, which are very narrow and tortuous, was made the occasion of a popular demonstration in the place.

The Public Lighting of Leeds.—The Lamp Committee of the Leeds Corporation show commendable energy in the carrying out of their duties. They often make tours of the city to ascertain points at which new lamps are needed for improving the lighting of the streets, courts, and alleys; and, owing in large measure to their labours, no less than 600 new lamps were erected during the last twelve months. There are now 11,000 public lamps in use in the city.

The London County Council and the East London Water Company.—At the meeting of the London County Council last Tuesday, the Joint Parliamentary and Water Committee reported that they had considered the course to be adopted with reference to the East London Water-Works (Height of Supply) Bill; and as, under all the circumstances, and having regard to the present position of the water question, the prosecution of the Bill was not likely to be successful, they thought the Council would be well advised to let it drop. They recommended, therefore, that the Bill be not proceeded with. Mr. Leon spoke energetically against the singular position of the Company; declaring that it was not right that they should not be compelled to supply water to a greater height than 40 feet, while the others had to go up to 70 feet. He thought the Committee had not been wise in bringing forward their recommendation; and he therefore moved that the report be referred back. Mr. Ward seconded the amendment. Mr. Clarke said that it was useless to discuss the matter, when the Bill was perhaps killed. Mr. Costelloe hoped that, at a time when the Council's measures were being wrecked, they would stick to the present Bill. The amendment was carried by 28 votes to 21.

THE CHESTERFIELD GAS AND WATER WORKS.

The New Board Take Possession.

The Chesterfield Gas and Water Board have lost no time in availing themselves of the Umpire's award, and entering into possession of the works of the Gas and Water Company. The change was quickly and unostentatiously effected last Wednesday. A cheque was made out for £231,836, and signed by Mr. John Hall (Chairman), Mr. A. C. Locke (Mayor), and Dr. G. Booth, J.P., and paid by them to the banking account of the Company. The members of the Board then visited the gas-works, where they were received by the Engineer and Manager (Mr. C. E. Jones). The gates of the premises were locked by him, and the keys handed over to Mr. Hall, who unlocked them, and took possession on behalf of the Board. Mr. Jones announced that he and the staff had agreed to stay on in the service of the Board; and he introduced the chief officials to the members present. Mr. Hall remarked that the Board had been pleased to re-appoint Mr. Jones as Manager, and all the old staff to their respective places. He hoped they would serve the new authority as faithfully as they had done the old Company. Mr. Jones, for the staff, expressed their loyalty to the Board; and the formal proceedings ended.

A local paper, commenting upon the above event, says: "Now that the public have had time to study the figures, the feeling is very general that the town is to be congratulated upon the amount of the award. They have obtained an undertaking which, whatever the faults that may be alleged against those who have been its conductors, is a sound, paying concern, at a low price."

EAST LONDON WATER-WORKS COMPANY.

The Half-Yearly Report and Accounts.

In the report to be presented at the half-yearly general meeting of this Company next Thursday, the Directors state that the revenue in the six months ending Christmas last was £160,366, as compared with £158,156 in the corresponding period of 1894; being an increase of £2210. The expenditure was £73,376, against £62,193 (including a payment of £727 to the Chamberlain of London) in 1894—an increase of £11,183. They explain that the above comparison of revenue does not, owing to a change in the mode of dealing with certain items in the account, fully represent the improvement in the Company's business. The increase of water-rates amounted to £4024, which the Directors consider satisfactory. The increase of expenditure is very heavy. It comprises further charges for relaying mains, expenses connected with the drought, parliamentary and law charges, and other outlays over which the Directors have had no control. The extensions of works, machinery, and mains are proceeding expeditiously and satisfactorily; and the whole of the Company's plant is in excellent condition. The quantity of water pumped in the six months reported upon was 8,555,741,815 gallons. The new services laid on numbered 2867, against 2253 in 1894. The total number of services is now 183,844. The Directors point out that the inquiry instituted by the Local Government Board into the alleged failure of this Company's supply in the summer of 1895, and held by Colonel Ducat, R.E., and Dr. Barry, ended in a complete justification of the Company upon all the allegations brought against them. They refer to the large number of Water Bills in the House of Commons, and to the introduction of the Government Bill providing for the creation of a Water Trust. Of course, all these measures are receiving the careful and anxious consideration of the Directors. They recommend that a dividend on the ordinary stock at the rate of 3½ per cent. for the half year (less income-tax) should be declared. This will absorb £60,219, and leave an unappropriated balance of £8443.

NEW WATER SUPPLY FOR THE SUBURBS OF PARIS.

The Anderson Purification System.

In response to an invitation from the Compagnie Générale des Eaux, the Prefect of the Seine, accompanied by a large number of officials and others interested, visited on the 21st ult. the new water-works at Choisy-le-Roi, which, together with similar works at Neuilly-sur-Marne and Nogent-sur-Marne, are now supplying river water, purified by the Anderson revolving process, to about 600,000 inhabitants of the suburban communes of the Department of the Seine. After a reception at the railway station by the Municipality of Choisy, the guests were conducted over the works by M. Mallet, President of the Board of the Company, assisted by several of his colleagues, as well as by M. Talandier, the Manager, and M. Boutan, the Chief Engineer. At the close of the inspection, the Prefect of the Seine delivered an address, in which he referred in detail to the former unsatisfactory state of the water supply in the Parisian suburbs, which the new works were intended to remedy. He explained that the cost of the works would be met by a hardly perceptible increase in the price charged for the purified water. After briefly recapitulating the processes through which the river water passed, he pointed out that the guests could personally satisfy themselves as to its absolute limpidity and freedom from taste after purification, and mentioned that the results of analyses showed that it was of equal purity to the spring water supplied to the City of Paris. He concluded by congratulating the communes of the department on the new supply, and by thanking the Conseil-Général of the Seine for the financial guarantee they had given, and the officials of the Company for the way they had carried out the work.

The system of purification employed is the well-known Anderson iron process, which has been in successful operation for more than ten years in Antwerp, and is also in use at Dordrecht, Gouda, Monte Video, Agra, Libourne, Nice, Constantinople, and other places. It has been adopted in the present case after the severest scrutiny, and comparison with all other systems. The purifying works at Choisy consist of six

14-inch Anderson's patent revolving purifiers, in which the water is agitated with scrap-iron. After passing these, it is led through a settling arrangement to the sand filters, which are fifteen in number; the total area of sand surface being about 100,000 square feet. The average output of these works is 6½ million gallons a day. The works at Neuilly and Nogent bring the total quantity of river water purified and distributed in the suburbs up to 15½ million gallons daily. However, since starting on Jan. 1 last, it has been decided to enlarge the works to an average total capacity of about 24 million gallons daily; the process having already proved eminently successful. It was guaranteed that, on an average, 99·6 per cent. of the microbes in the original water should be removed; and this condition is more than fulfilled, though the speed of filtration employed is 80 gallons per square foot of sand area per 24 hours. These works serve the whole of the suburban communes of the Department of the Seine, with the exception of a few supplied by the Compagnie des Eaux de la Banlieue. This Company have, however, also decided to adopt the Anderson process; and they are about to erect works at Suresnes.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Having now seen Mr. Vernon Harcourt's report upon the accident at the Forfar Gas-Works in November last, I can only say that it convinces me of the wisdom of holding an inquiry by a competent person into the circumstances attending an occurrence of the kind. Mr. Harcourt has not arrived at a definite finding as to the cause of the accident; but he almost rejects the theory of foul play, and looks more to natural causes. He makes out such a good case that it is difficult to disagree with him. Still, the report being indeterminate, it is possible to entertain doubt as to what natural cause, or combination of natural causes, could have led to the occurrence. How, for instance, was it that the natural cause did not operate during the time that three retorts were opened, drawn, charged, and re-closed, but only made up its mind to act while a fourth retort was open? The attack, so to speak, was sudden, and had not the appearance of having been the result of accumulating circumstances. And it was also short; for, according to testimony, it was over almost at the same time as the explosion took place. Then, two pailfuls of water in a hydraulic main 23 feet long, would have very little effect in restoring a seal which had been blown out, which points to the likelihood of the cause having been otherwise removed. These are difficulties which are left unexplained; and the mystery surrounding the occurrence is as great as it ever was. At the same time, it is impossible not to recognize in Mr. Vernon Harcourt's report, a learned and well-written treatise on a subject of some obscurity. His recommendations, whatever was the cause of the accident, will be easily attended to. The next question is as to the attitude of the Corporation towards the report. When they meet to consider the subject, I do not expect that the sum of human knowledge will be very much increased by their deliberations.

The Valuation Appeal Court has decided a question which has been before them for three different years, relating to the value of the property of the Furnace Gases Company, of Glasgow, at the works of the Shotts Iron Company. The Furnace Gases Company are in right to a lease of ground within the Shotts Iron Company's works, for which they pay £40 a year, and upon which they have erected plant for the treatment of waste gases. The industry has turned out an exceedingly profitable one; and the Assessor for the county of Lanarkshire naturally desired to have the works assessed at something like their value to the owners of them. On two former occasions he was unsuccessful, because of a provision in the lease to the effect that at its close the Furnace Gases Company might be required to clear away the whole of their works. In this state of matters, they could neither be proprietors nor tenants in any other sense than that of paying £40 a year for the use of the ground; and this sum was, on the two former occasions, directed to be entered as the valuation. But last year an amended Valuation Act was passed, chiefly to enable assessors to deal with subjects in the position of those belonging to the Furnace Gases Company. Under this statute, the Assessor entered the Company's property at £2360. The Company claimed to be exempted, under section 4, sub-section 3, of the new Act, in respect that their works were connected with coke-ovens held under a lease of minerals. The Court decided that the Company were not entitled to the exemption; and the assessment was confirmed.

The following announcement was made on Wednesday regarding a meeting on the previous day of the Electric Lighting Committee of the Glasgow Corporation: "It was agreed that the officials of the Committee should consider the question of the extended lighting of the city by electricity; and also investigate into the relative merits of gas lighting, as compared with incandescent electric lighting, for use in the subsidiary streets. In the meantime, it was agreed to push forward the alterations of the lamps at the Charing Cross end of Sauchiehall Street; converting them from the present astragal form into hanging globes, similar to those used in other cities. The Committee felt, on the whole question of the electric lighting of the streets, that the effect of the Corporation having been comparatively early in the field was that they were suffering from many initiatory blunders that had been made; and that in carrying out further improvements, they would profit by the experience they had gained." All this may mean much, or it may mean little. It looks very much like one of the alarums which sometimes accompany stage demonstrations. The Corporation, it seems to me, are making too much of the initial error plea. I am afraid they would be nearer the truth if they were to admit that part of their plant is practically worked out, and were to face the situation straightforwardly. In this view, what will become of the electric lighting undertakings in other towns? For how many years may they be expected to remain effective?

Another announcement of interest to the owners of electric lighting undertakings is that on Sunday night the lights in George Square, Glasgow, went out. Where the interest comes in, is that there is a disposition in some quarters to remove the gas-lamps, pillars, and connections from streets where the electric light has been introduced. In Edinburgh, there are several miles of streets without gas lamps. I consider this very risky, on account of the liability of the electric light to sudden failure. One night's stoppage would lead to much abuse of the Committee who have ordered the removal of the gas-lamps.

When making his last monthly statement as to revenue for gas and electric current supplied, the Glasgow Corporation Gas Treasurer (Mr. J. Fleming) reported that the gas-rental up to Feb. 26 for the year commencing on June 1, 1895, amounted to £250,569, as compared with £240,161 for the corresponding portion of the financial year 1894-5; so that there was an increase amounting to £8408 even with the reduction of 2d. per 1000 cubic feet made since June 1, 1895. The electric lighting rents also showed a decided increase. Up to the date mentioned, they amounted to £12,524, against £9957 in the corresponding period of 1894-5. In this case, the increase had reached to £2567.

The revenue derived from the sale of residual products by the Glasgow Corporation Gas Commissioners during the eight months ending on Jan. 31 last amounted to £80,337, as compared with £93,178 in the corresponding eight months of the financial year 1894-5. These figures show a decrease amounting to £12,841, which is a very considerable sum in that department of the Gas Trust revenue.

The Contracts Sub-Committee of the Glasgow Gas Trust have just taken in the tenders for the supply of retorts for their several gas-works during the financial year commencing on the 1st of June next. It is understood that three firms have sent in tenders. The retorts measure 9 ft. by 21 in. by 15 in., and weigh about 15 cwt. each; and it is calculated that, off and on, about 600 of them will be required. During the current year, the Glasgow contract has been in the hands of the Glenboig Company, while the contract with the Edinburgh and Leith Gas Commissioners was taken by Mr. Hurll. For the running contracts, the price is stated to have been about 37s. 6d. per retort; for the year 1896-7, however, it is expected that the price will be somewhere about 30s. per retort, as the "arrangement" or "understanding" that is said to have hitherto existed is now at an end. The prices paid by the Glasgow Gas Trust and the Edinburgh and Leith Gas Commissioners largely determine the prices charged throughout the rest of Scotland and over a large part of Ireland. The trade is just now fairly busy, if not even very active.

The extension which the Glasgow Corporation Gas Commissioners have resolved on making at their Dawsholm works will be a duplication of the retort-house and coal-store that was erected within the past six or eight years, in which there are two benches of retorts, front and back, 64 ovens of eight retorts each, or 512 retorts in all. Consequently this extension will eventually admit of the manufacturing power at Dawsholm being increased to 1846 retorts, as the house that was first built there contains 832 retorts, in 104 ovens.

There are numerous movements on foot, in various parts of Scotland, to form lighting and water supply districts under the Local Government Act of 1889. These movements, while they show the great advance in the provision of comfortable surroundings which is being made by what are practically rural districts, are also valuable to purveyors of light, because of the increased business which they bring to them. One of the most typical instances was brought up the other day, when at a meeting of the Upper District Committee of the Renfrew County Council, a statement was submitted by the Clerk showing the capital and annual cost and probable rate of assessment involved in lighting the districts of Giffnock, Thornliebank, and Mansewood, for which requisitions to form lighting districts had been received. The statement showed that the total valuation was about £15,063; and the capital expenditure in connection with the whole lighting districts would be £345 12s. If the lamps were lit for eight months of the year, the annual expenditure would amount to £368 16s.; and if lit for six months, the cost would be £315 16s. The assessment, if the lamps were lit for eight months, would be equivalent to 5¼d. per pound on estimated assessible valuation; and if lit for six months, the assessment would be at the rate of 5d. per pound. In future years, leaving out the cost of forming the special district, the probable rates of assessment would be 5⅛d. and 4¾d. per pound respectively. Consideration of the matter was delayed. The assessment is no doubt a heavy one to impose, in addition to existing burdens; but evidently communities are prepared to face considerable charges for lighting, in view of the benefits derived from better lighted thoroughfares.

There have been several inquiries of late by sheriffs of counties, into applications for Provisional Orders to authorize the appropriation of water for the supply of small towns and rural districts. The proceedings are for the most part formal. In the case of one particular inquiry, however, which terminated this week, there was strong opposition. The petition was by the Dunfermline District Committee of the Fife County Council, who sought power to supply the village of Kelty with water from Loch Glow. The opposition was by the River Leven Trustees, who stated their belief that the abstraction of the water from the loch, which drains into the Leven, would reduce the flow of the river in dry seasons to an extent which was not desirable. The objection was really founded upon the fact that the River Leven is very badly polluted by refuse from mills being discharged into it; and there is a proposal to construct a large sewer to carry the refuse to the sea. Were the sewer constructed, it would be desirable to have as large a flow of water as possible. The promoters asked power to take 770,000 gallons per day, and to give as compensation 243,413 gallons. After leading evidence for four days, the parties effected a compromise, in terms of which the maximum supply to Kelty is fixed at 162,500 gallons of water per day, and the River Trustees are to have the regulation of the water.

Mr. Buckley on the Manufacture of Coal Gas.—Last Thursday, Mr. J. W. Buckley, Assoc.M.Inst.C.E., of Falmouth, the Consulting Engineer to the St. Ives Corporation, gave a lecture in the Public Hall in the latter town on the subject of the manufacture of coal gas. He mentioned that William Murdoch, the inventor of gas lighting, lived at Redruth, and used gas in his house there. The lecturer dealt with the history and development of gas, and afterwards described the plant and operation of a complete gas-works, with special reference to those at St. Ives. The Mayor (Mr. E. Hain) presided; and Mr. Buckley (who promised to give another lecture on the economic use of gas) was warmly thanked.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 28.

Sulphate of Ammonia.—The recent drooping tendency of the market has been further accentuated during the week; and, at the close, there are many sellers, with an almost entire absence of large buyers. This acute depression has not been occasioned by any falling off in exports—the exports up to the middle of March being, in fact, some 6000 tons in excess of those in 1895 during the same period; but by the action of the London sellers. The buying for "covering" March sales, expected in the north, has this month been done mainly in London; the London holders, in order to secure the business, having accepted prices below those current at other ports. Hence the available supplies in the country have become more abundant than they have been for a long time; the demand for home consumption not having been sufficient to absorb them. Any further decline will depend much upon the action of London. If, after their recent large sales, they now hold for higher prices, the demand for home and export may be sufficient to steady the market; but if there is any more free selling, some further decline may be looked for. Over summer months, there are sellers at a small premium; but buyers are decidedly reserved in this position. There is, however, considerable inquiry for autumn delivery; and there would be buyers at some advance upon spot prices. The quotations for prompt are £8 2s. 6d., Hull and Leith; and £8 3s. 9d., Liverpool.

Nitrate of Soda is fairly steady at 8s. to 8s. 1½d. per cwt. on spot.

LONDON, *March* 28.

Tar Products.—The market is undoubtedly dull; and prospects are not so cheery. Benzols, which had touched 2s. 2d. for early delivery, are now again weaker, with a further inclination to fall. There is some inquiry for the last half of the year, both for benzols and for naphthas; but buyers' ideas of price are not received well by makers. Fortunately there are no stocks of benzols in this country; and if the important improvement in the dyeing trade comes on, there is no reason why benzols should fall in price. Pitch is languid; and, although there are some buyers, low prices only bring business. Carbolic acid is steady; but prices are said to be shaded by some sellers. There is a fair inquiry for naphthalene; but creosote and common tar oils are unsaleable. Anthracene is moderately firm, little new business doing.

Values during the week may be taken as follows: Tar, 18s. to 22s. 6d. Pitch, 30s. to 33s. Benzols, 90's, 2s.; 50's, 1s. 8½d. Toluol, 1s. 6d. Solvent naphtha, 1s. 2d. Crude, 30 per cent., naphtha, 9½d. Creosote, nominal, 1½d. Naphthalene salts, pressed, 47s. 6d.; drained, 25s. Cresylic acid, 1s. 1d.; brown, 10d. Carbolic acid, 60's, 2s. 2d. Anthracene, "A" quality, 10½d.; "B," 8d. to 9d.

Sulphate of Ammonia goes from bad to worse; and the market during the week has been distinctly weak. Business is reported at from £8 to £8 5s. all ports, less 3½ per cent. Gas liquor is offered at 5s. 9d. to 6s. 9d.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Business in the coal trade here still drags on very slowly; the position being, if anything, worse rather than better. In many cases, stocks at the close of the winter are so heavy that pits will during the forthcoming summer most likely have to go on even shorter time than last year. House coals meet with only a limited demand; business showing a decided slackening off, with the advent of spring. Pits are generally not kept going more than four days per week; while prices here and there show a weakening tendency—concessions being often necessary to effect sales of surplus quantities. Steam and forge coals continue in but indifferent request; and even with the general limitation of the output, supplies offering on the market are much larger than requirements. The result is that extremely low prices continue to rule; a still further giving way being noticeable in some of the inferior descriptions where quantities have to be moved away. At the pit mouth, best Wigan Arley averages 10s. per ton; Pemberton four-feet and seconds Arley, 8s. 6d. to 9s.; common house coal, 7s. to 7s. 6d., with good qualities of steam and forge coal not fetching more than 6s. to 6s. 6d. A fair business is being done in the better qualities of engine fuel; and at some of the collieries there is a scarcity of supplies to meet the requirements of customers. At others, however, the output is still fairly plentiful; so that any upward move in prices is rendered impracticable. Little success has attended the efforts of colliery proprietors to secure an advance upon forward contracts; and the full average prices for the better qualities of slack remain at 4s. 6d. per ton, with 5s. quoted for some special sorts. Common descriptions still move off but slowly; and prices continue at a very low level—from 3s. to 3s. 6d. representing about the average pit prices. For shipment, business is quiet, with prices excessively low; reductions upon late rates being occasionally made to secure orders. For delivery at the Garston Docks or the High Level, Liverpool, common coal, suitable for bunker purposes, can be readily bought at 6s. 9d. to 7s. per ton; while for delivery at the Partington tips of the Manchester Ship Canal, about 7s. to 7s. 6d. represents the average figure.

Northern Coal Trade.—There has been a slight increase of activity in the coal trade of this district; and with the early opening of northern navigations, it may be reasonably expected that there will be a larger shipment of both steam and gas coals. Best Northumbrian steam coals are quoted at 7s. 9d. per ton f.o.b. for prompt delivery; and for delivery over the season, 8s. 3d. is the current quotation, though this figure is not willingly paid by shippers. Second-class steam may be quoted at 7s. to 7s. 3d. per ton f.o.b. for prompt delivery; and steam small coals are firm at 3s. 9d. Collieries are working better than they were; but short time is still prevalent at many pits. Manufacturing coals are in rather better demand; and the price is firm. Gas coals are steady; and there has been confirmation of the rumour

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 682).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	16 Oct.	10½	Alliance & Dublin 10 p. c.	24½–25½	..	4 2 4
100,000	10	,,	7½	Do. 7 p. c.	17–18	..	4 3 4
300,000	100	2 Jan.	5	Australian (Sydney) 5% Deb.	108–110	..	4 10 11
202,000	10	16 Oct.	4	Belgrano (B. Ayres), Limited	8½–9½	..	4 4 3
100,000	Stck.	30 Dec.	5	Do. 5 p. c. Deb. Stk	95–100	..	5 0 0
200,000	5	14 Nov.	6½	Bombay, Limited	7¼–7⅞	..	4 3 10
40,000	5	,,	6½	Do. New, £4 paid	5¼–5¾	..	4 10 3
380 000	Stck.	27 Feb.	12	Brentford Consolidated	280–285	..	4 4 3
210,000	,,	,,	9	Do. New	215–220	..	4 1 9
50,000	,,	,,	5	Do. 5 p. c. Pref.	—	..	—
159,375	,,	16 Dec.	4	Do. 4 p. c. Deb. Stock.	127–132	..	3 0 7
220 000	Stck.	27 Mar.	11	Brighton & Hove Original	230–235*	+5½	4 13 8
208,820	,,	,,	8	Do. A Ord. Stk.	182–187*	+1	4 5 6
933,500	Stck.	27 Feb.	5	Bristol, 5 p.c. max.	123–126	..	3 19 4
420,000	20	27 Mar.	11½	British	55–56†	..	4 0 4
50,000	10	12 Mar.	11½	Bromley, Ordinary 10 p. c.	22½–23½	..	4 17 10
71,000	10	,,	8½	Do. 7 p. c.	19–20	..	4 5 0
500,000	10	14 Nov.	4	Buenos Ayres (New) Limited	9½–10	..	4 0 0
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	102–104	..	5 15 5
150,000	20	27 Feb.	8½	Cagliari, Limited	29–31	..	5 6 5
100,000	10	27 Sept.	8†	Cape Town & District, Ltd.	13¾–14½	+1	5 10 4
50,000	50	2 Nov.	6	Do. 6 p. c. 1st Mort.	57–59	..	5 1 9
550,000	Stck.	16 Oct.	13½	Commercial Old Stock	332–337	..	4 0 2
165,000	,,	,,	10½	Do. New do.	257–262	..	4 0 3
165,000	,,	16 Dec.	4½	Do. 4½ p. c. Deb. do.	147–152	..	2 19 2
800,000	Stck.	16 Dec.	13	Continental Union, Limited.	278–283	..	4 11 10
200,000	,,	,,	10	Do. 7 p. c. Pref.	215–220	..	4 10 11
51,600	Stck.	27 Feb.	14	Croydon Com'cial A 10 p. c.	—	..	—
157,500	,,	,,	11	Do. B 7 p. c.	—	..	—
535,000	Stck.	27 Feb.	5½	Crystal Palace Ord. 5 p.c. Stk	130–135	..	3 17 9
60,000	,,	,,	5	Do. 5 p. c. Pref.	—	..	—
486,090	10	30 Jan.	11	European, Limited	26–27	–½	4 1 6
354,060	10	,,	11	Do. £7 10s. paid	17⅞–18⅛	..	4 9 3
5,746,590	Stck.	13 Feb.	12¾	Gaslight & Coke, A, Ordinary	295–300	+5	4 5 0
100,000	,,	,,	4	Do. B, 4 p. c. max.	108–113	..	3 10 9
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	288–293	..	3 8 3
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	140–145	..	3 9 0
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	205–210	..	3 11 5
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	200–205	..	3 8 3
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	287–292	..	3 8 6
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	168–172	..	3 9 8
1,061,150	,,	16 Dec.	4	Do. 4 p. c. Deb. Stk.	138–142	..	2 16 4
234,850	,,	,,	4½	Do. 4½ p. c. do.	148–153	..	2 18 9
908,000	,,	,,	6	Do. 6 p. c. do.	204–209	..	2 17 5
70,000	10	30 Oct.	6	Hongkong & China, Limited	13–14	..	4 5 8
3,800,000	Stck.	14 Nov.	12	Imperial Continental	250–254	+2½	4 14 5
376,400	100	1 Feb.	4	Do. 4 p. c. Debs. Red.	100–103	..	3 17 8
473,600	Stck.	13 Feb.	3½	Do. 3½ p. c. Deb. Stk ,,	108–110	..	3 3 8

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
75,000	5	16 Dec.	6	Malta & Mediterranean, Ltd.	6–6½	..	4 12 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	115–118	..	4 4 10
250,000	100	,,	4½	Do. 4½ p. c. Debs.	109–111	..	4 1 1
541,920	20	14 Nov.	5	Monte Video, Limited	16½–17½	..	5 14 3
150,000	5	28 Nov.	8	Oriental, Limited	8½–8¾	..	4 11 5
135,000	5	,,	8	Do. New, £4 10s. paid	7½–7¾	..	4 12 10
15,000	5	,,	8	Do. do. 1879, £1 paid	1½–2	..	4 0 0
60,000	5	12 Mar.	7	Ottoman, Limited	4¾–5¼	..	6 13 4
166,870	10	—	2	Para, Limited	1–1½	..	—
420,000	100	2 Nov.	6	People's Gas } 1st Mtg. Bds.	105–110	..	5 9 1
500,000	100	9 Dec.	6	of Chicago } 2nd Do.	100–105	..	5 14 3
250,000	10	27 Mar.	8†	San Paulo, Limited	12½–13½†	..	5 11 1
500,000	Stck.	13 Feb.	15½	South Metropolitan, A Stock	387–392	..	3 19 1
1,350,000	,,	,,	12	Do. B do.	310–315	..	3 16 2
310,000	,,	,,	13	Do. C do.	327–332	..	3 18 3
800,000	,,	16 Jan.	5	Do. 5 p. c. Deb. Stk.	175–178	..	2 16 2
60,000	Stck.	12 Mar.	11½	Tottenham & Edmonton, A	250–255	..	4 10 2
60,000	,,	,,	8½	Do. B	—	..	—
170,380	10	30 Dec.	10	Tuscan, Limited.	13–14	..	7 2 10
149,900	10	2 Jan.	5	Do. 5 p. c. Debs. Red.	100–102	..	4 18 0

WATER COMPANIES.

746,021	Stck.	30 Dec.	10½	Chelsea, Ordinary	323–328	+3	3 2 6
150,000	,,	,,	5	Do. 5 p. c. Pref.	170–175	..	2 17 1
160,000	,,	,,	4½	Do. 4½ p. c. Pref. Stk., 1875	—	..	—
175,785	,,	27 Mar.	4½	Do. 4½ p. c. Deb. Stock	155–160*	+2½	2 16 3
1,719,514	Stck.	16 Oct.	7	East London, Ordinary	250–255	–2	2 14 10
654,740	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	155–160	..	2 16 3
100,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	105–107	..	2 16 1
700,000	50	16 Dec.	6½	Grand Junction, 10 p.c. max.	127–132	..	2 9 3
280,000	Stck.	27 Mar.	4	Do. 4 p. c. Deb. Stk.	148–152*	+2	2 12 8
708,000	Stck.	13 Feb.	12	Kent	332–337	..	3 11 2
160,000	,,	,,	7	Do. New, 7 p. c. max.	207–212	+2	3 6 0
1,043,800	100	30 Dec.	7½	Lambeth, 10 p. c. max.	274–279	+1	2 11 11
406,200	100	,,	7½	Do. 7½ p. c. max.	225–230	..	3 3 1
330,000	Stck.	27 Mar.	4	Do. 4 p. c. Deb. Stk.	147–152*	+2	2 14 8
500,000	100	13 Feb.	12¾	New River, New Shares	420–430	..	2 19 3
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk.	153–158	..	2 10 8
902,300	Stck.	16 Dec.	6	S'thwk & V'xhall, Ordinary	170–175	..	3 8 5
126,500	100	,,	6	Do. Do. 7½ p. c. Max.	155–165	..	3 12 9
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	168–173	..	2 17 9
1,019,585	,,	—	4	Do. 4 p. c. A Deb. Stk.	147–152	..	2 12 8
1,155,066	Stck.	16 Dec.	10	West Middlesex	310–315	+5	3 3 6
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	155–160	..	2 16 3

*Ex div.

† Next dividend will be at this rate.

that a larger part of the Rotterdam gas coal contract has been placed with Durham collieries. Out of the total of about 75,000 tons, two-thirds are this year allotted to Durham; and the remainder has gone to German coalowners. The price of the coal from the local pits will be from 6s. 3d. to 6s. 4½d. per ton. There is no alteration in the rate of prices for odd cargoes of gas coal. A better demand prevails for smithy coal, which is shipped in considerable quantities from the local ports. In coke, the activity continues, and, indeed, increases; the demand being enlarged especially from the north-west, where more furnaces are being put into blast. At the Teeside furnaces, the price of good Durham coke is 13s. 9d. to 14s. per ton. Exports of coke are rather increasing; and for good coke, the price is now 14s. 9d. to 15s. per ton f.o.b. In some of the inland centres, gas coke is still in considerable stock; but on the seaboard the stocks are kept down.

Scotch Coal Trade.—The demand for coal is improving in Scotland; but prices have not, as yet, been affected. As has been the case for many months, the greatest demand is for small varieties, some of which are actually scarce. Prices for the larger sorts have now been brought so low that users can afford to take them; and the result is that steam and ell are meeting with a readier sale. For splint, the demand is about equal to the output. The prices quoted are: Main, 5s. 9d. per ton f.o.b. Glasgow; ell, 6s. 6d. to 6s. 9d.; splint, 6s. 3d. to 6s. 6d.; and steam, 7s. 6d. The shipments for the week amounted to 124,164 tons—an increase of 19,422 tons over the preceding week, and of 4974 tons over the same period of last year. For the year to date, the total shipments have amounted to 1,344,906 tons—an increase on the quantity in the corresponding period of last year of 144,999 tons.

Extension of the Stoke Gas-Works.—An important addition, in the shape of two large purifiers, 25 feet square, has been made to the Stoke Gas-Works. The work is of a very substantial character, and has been carried out by Messrs. W. C. Holmes and Co., of Huddersfield, in accordance with plans and specification prepared by the Gas Engineer and Manager (Mr. W. Prince). The capacity of the purifying plant is now double what it formerly was. The Gas Committee met the contractors on Thursday last; and, after they had carefully inspected the work, the Chairman (Mr. F. Geen) turned the gas through the purifiers. This addition will cost upwards of £1000; and it forms the first part of an important scheme for the improvement and enlargement of the plant, &c. This sum will be paid out of profits, as will be the case with most of the contemplated additions; the Committee being strongly of opinion that to borrow money for such purposes, and thereby increase the already high figure at which the loans stand, would be both impolitic and unsound. Notwithstanding this payment, the Committee have handed to the Corporation £2890 out of the current year's profits, in reduction of the rates. When the scheme is completely carried out, the works will meet the requirements of the borough for a very long period.

Ellesmere Water Supply.—On behalf of the Local Government Board, Colonel W. L. Coke last Wednesday held a public inquiry into an application by the Ellesmere District Council for sanction to the borrowing of £4000 for works of water supply. The Engineer (Mr. T. S. Stooke) explained the general principles of the proposed water supply, which was to be obtained from the Liverpool Corporation Water-Works by an 8-inch main to the town, with 4-inch distributing-pipes. The Inspector inquired why the application was to borrow £4000, as he noted the estimated cost of the works was only £2900. The Chairman (Mr. B. R. C. Tower) explained that the additional borrowing powers were asked for in case the Council wished to construct a reservoir, which was not included in the estimate. There was no opposition to the scheme.

Sales of Shares.—At a local sale last Wednesday, £10 shares in the Boston Gas Company realized £19 5s. each; and £25 shares in the Boston Water Company, £52 2s. 6d.——At Durham last Wednesday, Mr. Bowden offered for sale 2000 4 per cent. £5 preference shares in the Consett Water Company; the prices obtained varying from £6 2s. to £6 10s. each.——On the same day, Messrs. Ridley and Hollis sold by auction at Hayward's Heath a parcel of £5 fully-paid ordinary shares in the Cuckfield Gas Company, at an average of £8 per share.——A parcel of 100 shares in the Torquay Gas Company was sold in the town last Wednesday. Thirty £10 shares, bearing a dividend of 10 per cent., were sold in two lots at £23 7s. 6d. and £23 10s. per share. Seventy £10 shares, bearing a dividend of 7 per cent., were purchased at £16 10s. each.——At Preston last week, Messrs. T. Dewhurst and Son offered for sale some "A" stock of the Preston Gas Company, which was sold at £190 10s. and £200 per cent.

The Local Government Board and the Guildford Water Supply.—The Local Government Board have sent a letter to the Guildford Town Council in respect of the water supply. It will be remembered that several schemes have been submitted to the Council for the construction of new water-works; but in the end the Corporation adopted one in accordance with a report prepared by a Committee in consultation with the Engineer in charge of the existing works. The Local Government Board now state that they are unable to regard as satisfactory the suggestion of the Council that the works necessary for rendering the water supply thoroughly efficient should be delayed indefinitely; and they point out, as they had done before, that the condition of most of the existing machinery is such that further expenditure on it will, in their opinion, be practically a waste of money. They therefore consider it is not only the duty of the Council, but will prove ultimately the most economical course, to execute the work necessary to make the supply thoroughly satisfactory. The Board therefore suggest that the Council shall give further consideration to the matter, with a view to carrying out the comprehensive scheme prepared by Mr. Phillips. At a meeting on Friday, the Council decided to proceed with the work, as the Local Government Board could not interfere unless they were asked to sanction a loan in respect of the scheme.

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No.	External Dimensions.			Oven.			Hot Plate.	No. of Boiling-Burners	Price.	White Enamelled Crown extra.
	High.	Wide.	Deep.	High.	Wide.	Deep.				
401	18½	13½	11½	14	11	9½	13½ by 11½	1	28/6	—
402	24½	15½	15	18	11	11	15½ ,, 15	2	40/-	2/6
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404	30	18	17	19	13½	11	18 ,, 17	2	50/-	2/6
404	If fitted with Enamelled-Lined and Jacketted Door and Fire-Brick Crown, as adopted by The London Gaslight and Coke Co.								55/-	2/6

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Gas Exhibition at Tonbridge.—A most successful gas and local trades exhibition was held at Tonbridge from the 13th to the 21st inst.; the principal exhibitors being Messrs. Richmond and Co., Limited. The result has been orders for about 100 cookers. The Directors of the Gas Company expressed their great satisfaction at the energetic manner in which the exhibition was managed by their Engineer (Mr. J. Donaldson) and by Messrs. Richmond. Lantern lectures were given on two evenings to crowded audiences by Mr. Richmond. A gas-cooked supper, at 1s. 6d. per head, was a great attraction. Miss Barker, of the South Kensington School of Cookery, conducted the cookery lectures, and was a great success.

Tynemouth Gas Company.—The annual meeting of this Company was held last Thursday. The Directors' report stated that the revenue for the year amounted to £32,372; and the expenditure, to £25,306—leaving a profit of £7066. The balance of undivided profit last year was £558; making a total of £7624, which the Directors proposed to deal with as follows: An interim dividend of 5 per cent. on original stock, and 3½ per cent. on new share capital, £2859; second half-year's dividend, at the same rate, £2859; and plant renewal fund, £1000—total, £6718, leaving a balance of £905 to carry forward. The Directors regretted the loss by death of Mr. John Moffat, who held the position of Chairman for many years. Mr. J. B. Williamson had been unanimously elected Chairman, and Mr. John Taylor to fill the vacancy. The report was adopted.

The Reinstatement of Roads.—At a recent meeting of the Woolwich Local Board, it was reported that a deputation had had an interview with Mr. Livesey, with reference to the breaking up of the streets and roadways by the South Metropolitan Gas Company in the Woolwich district. It was stated at a previous meeting that it was likely that the Company would make arrangements for the paths and roads to be reinstated by the Board. It was now reported, however, that the Company preferred to do the work themselves; and they had agreed that if any defect was found, the Board should, at the expense of the Company, put down a little granite in the event of subsidence, and roll the road in cases where the level was not satisfactory. The Surveyor was instructed to see that the roads were properly reinstated in every case, and to provide the steam roller and granite when required.

New Joint-Stock Companies.—The Gas Enrichment and Solar Oil Company, Limited, has been registered with a capital of £200,000, in £1 shares (75,000 of which are 6 per cent. preference) to acquire the British patents of Dr. Dvorkovitz, or any other similar patents, relating to improvement in the manufacture of gas and bye-products from petroleum; also to carry on business as producers and suppliers of water gas, enriched or not by oil gas; to import various petroleum products; and to construct, maintain, or improve, acquire, and work any railways, tramroads, steam or other vessels, &c. Trapp's Oil-Gas Fuel Patent Syndicate, Limited, was registered in Edinburgh last week, with a capital of £1000, in £1 shares, for the purpose of acquiring, working, and developing, in the United Kingdom and elsewhere, the inventions, patents, and other processes for improvements in and relating to regenerative and other furnaces, and for the heating of furnaces by the combustion of gas produced from oil, known as Trapp's oil-gas fuel patent.

Interfering with the Level of Mains.—The Canterbury Gas and Water Company having received notice from the City Surveyor of work which it was deemed necessary to be done in connection with the reforming of Hanover Road, Canterbury, the Company made inquiries, and found out that the road had been lowered so that their mains were within 18 inches of the surface, and consequently at an insufficient depth to protect them from the steam-roller and the action of the frost. Thereupon, bearing in mind the Surveyor's notice, the Company had the mains lowered at once, and notified to the Town Council that the expenditure in connection with this work would be charged to the Corporation. When this matter came before the Council last Wednesday, the Surveyor said the road had been lowered during the work of effecting public improvements; and the Company's pipes were left almost bare in some cases. Alderman Sanderson said this was because the pipes had not been put deep enough in the first instance. Alderman Cross said the fault lay with the Corporation in not having the levels taken before any new streets were made; and he certainly thought the Corporation were liable. The Town Clerk advised the settlement of the expenses in this instance without any liability being admitted by the Corporation; and this course was, in the result, agreed to.

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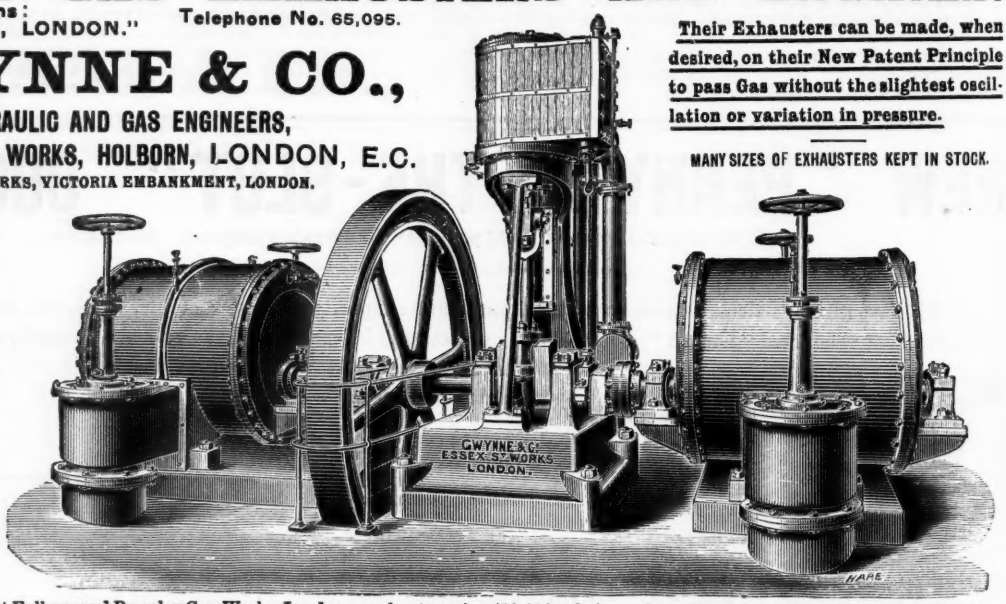

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*** See Advertisement p. II., centre of JOURNAL.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

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FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.

Before placing Orders, please write for Estimate.

EASTER HOLIDAYS.

NOTICE TO ADVERTISERS.—In consequence of the **EASTER HOLIDAYS**, orders with respect to **ADVERTISEMENTS** should be received at the Office *not later* than **THE FIRST POST ON SATURDAY NEXT.**

AMMONIACAL LIQUOR Wanted.
BROTHERTON AND Co., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR Wanted.
BROTHERTON AND Co., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE Wanted.
BROTHERTON AND Co., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID for Sale.
BROTHERTON AND Co., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

R. ANDREWS, Practical Retort-Setter, has NOT RETIRED from Business, as reported. RETORT SETTING in all its Principles and Branches. Established 1864.
Address 67, Sugden Road, Lavender Hill, LONDON, S.W.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and adroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."

In Paper Covers, Post Free 2s.

STEPHEN CARPENTER, of the Bow Common Gas-Works, on the Purification of Coal Gas by Lime, Oxide of Iron, and Atmospheric Air, and the Method of Working Purifiers so that the Lime may be used a second time, with a description of Carpenter's short Method of working off the Sulphur Test and Table for calculating Results.
S. & H. W. CARPENTER, 3, Bedford Villas, Carshalton, SURREY.

TO GAS COMPANIES MAKING SULPHATE OF AMMONIA.

THE Use and Value of Sulphate of Ammonia as Manure—A Leaflet, suitable for Distribution among the Farmers of their respective Districts, by WILLIAM ARNOLD, F.S.I., Land Agent, Rating Surveyor, and Valuer (late Chairman of the Tamworth Gaslight and Coke Company); together with valuable Formulæ, Rotation of Crops and Manures for the same, intended for the use of Tenant Farmers and others interested in Land, and to promote the sale of Sulphate of Ammonia for the production of Corn and other Crops by English Gas Companies.
Prices: 100 Copies, 10s.; 250 Copies, £1 2s. 6d.; 500 Copies, £2; 1000 Copies, £3 15s.
LONDON: WALTER KING, 11, Bolt Court, FLEET STREET.

WANTED, a Situation as Gas Stoker, to take charge of small Gas-Works. Married. Age 26. Six Years' References.
Address A. HANCOCK, 12, Elm Grove Terrace, Twerton, BATH.

GAS ENGINEERING.

A CONFIDENTIAL Clerk, Traveller, or Secretary (many years' Practical and Commercial Experience, familiar with Construction and Values of Gas Apparatus) seeks position where his Experience, Abilities, and strict Business Principles would meet with fair reward. Unquestionable References.
Apply, by letter, to No. 2647, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Gas Committee of the Leeds City Council invite APPLICATIONS for the post of SUPERINTENDENT of the WORKSHOPS, Comprising the Meter Fixing, Meter Testing, Meter Repairing, and Gas-Stove Departments.
Applicants must have a thorough practical knowledge of the above Trades, and be experienced in the Management of Men.
Salary, £150 per Annum.
Applications, accompanied by not more than three Testimonials, and addressed to the Chairman of the Gas Committee, Municipal Buildings, Leeds, will be received not later than Saturday, the 11th of April.
R. H. TOWNSLEY,
General Superintendent.

WANTED, by a Gas Company in Derbyshire, a second-hand Cast-Iron GAS-HOLDER TANK, 50 feet diameter by 20 feet deep (or thereabouts), in good condition.
Replies to be sent, in the first instance, to No. 2646, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

It is Worth Your While to Buy DIRECT.
THE RELIANCE LUBRICATING OIL COMPANY SUPPLY on APPROVAL "RELIANCE" NON-CORROSIVE LUBRICANTS (which, through their superiority, have the largest sale in the world)—viz., Engine, Cylinder, and Machinery Oils, 11½d.; Spindle Oil, 8½d.; Gas-Engine and Dynamo Oils, 1s. 6d. per gallon; Barrels Free and Carriage Paid. Also Liquids for Gas Making, Enriching, &c.
RELIANCE LUBRICATING OIL COMPANY, WATER LANE, GREAT TOWER, LONDON, E.C.
Depôts at Liverpool, Bristol, Hull, Glasgow, and Newcastle-on-Tyne. Telegrams: "Subastral, London."

ECONOMY IN PURIFICATION.

INCREASE the Efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.
References and Particulars can be obtained from the Makers—
C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP.
And J. EVERY & SON, Phœnix Iron-Works, LEWES.

WIDNES CORPORATION GAS AND WATER WORKS.

GAS PLANT, &c., FOR SALE.

THE Gas and Water Committee have the following PLANT for disposal: ANNULAR CONDENSER, ENGINE and EXHAUSTER (capacity, 22,000 Cubic Feet per hour), MANN and WALKER TOWER SCRUBBER, 38 ft. by 8 ft., and a WALKER PURIFYING-MACHINE of 1 Million Cubic Feet capacity per diem.
Further Particulars may be obtained on application to Mr. ISAAC CARR, Assoc.M.Inst.C.E., Gas-Works, WIDNES.

GAS PLANT, BUILDINGS, AND FREEHOLD LAND AT CARSHALTON, SURREY, FOR IMMEDIATE SALE.

THE Croydon Commercial Gas and Coke Company, having discontinued the Manufacture of Gas at their Works in Wrythe Lane, Carshalton, Surrey, have the following GAS PLANT, APPARATUS, BUILDINGS, and FREEHOLD LAND FOR SALE, viz.—
Retort-House and Coal-Store complete, with Wrought-Iron Roofs, six Beds of six Round Fire-Clay Retorts in each, 18 inches diameter by 9 ft. 3 in. long, and three Beds of similar new Retorts and Arches, and three Arches, complete, ready for Retorts.
Hydraulic Mains, Fittings, &c.
Horizontal Steam-Engine, Exhauster, and Exhauster Governor, complete.
Washer (Good's Patent), 8 feet diameter, with 12-inch Connections and Valves complete.
Washer, 12-inch, with 6-inch Connections and Valves complete.
Four Purifiers, 12 feet square, with Sieves and 12-inch Connections, Lifting Apparatus and Railway for same, complete.
Station Meter, 10,000 cubic feet per hour, with 12-inch Connections.
Gasholder (Single-Lift), 80 feet by 24 feet, with Brick Tank, Columns, Inlet and Outlet Valves complete, prepared for Telescoping.
Gasholder (Single-Lift), 60 feet by 16 feet, Standards, Brick Tank, &c.
Gasholder, 35 feet by 12 feet, Standards, Brick Tank, &c.
Governor, 12 inches diameter, with 12-inch Valves and Bye-Pass complete.
Evans Photometer, Clock, Gauges, &c., complete.
House and Offices, Engine and Boiler House, Meter-House, Lobby and Store-Room, Governor-House and Testing-Room, Purifying House and Shed, Smith's Shop.
Freehold Land, 3 acres, 0 roods, 37 perches (about 2 acres not built upon).
Orders to view the Plant and Works, and Particulars of Prices the Company require for the whole or any portion of the above, can be obtained on application to
W. J. RUSSELL,
Secretary.
Offices: Katharine Street, Croydon,
March, 1896.

REPORTS OF GAS ASSOCIATIONS.

A FEW complete Sets of the Reports OF GAS ASSOCIATIONS from 1883 to 1894, twelve Volumes) may be obtained of the PUBLISHER of the "JOURNAL," *Price 30s., cash with order.* The Volume for 1895 (or single copies of previous Volumes) *5s. 6d. post free.*

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

TO EMPLOYERS, COMPANY DIRECTORS, ETC.

THE LAW GUARANTEE & TRUST SOCIETY, LD.
GUARANTEES FIDELITY.

SEND for complete Prospectus con- taining Balance-Sheet, Copy of Policy, &c., &c. Mortgage, Debenture, License, and Contingency Insurance.
Head Office: 49, CHANCERY LANE, LONDON, W.C.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

REMOVAL.

PATENT OFFICE.

W. P. THOMPSON & Co., the Inter- national Patent Agents of London (also Liverpool, Manchester, and Birmingham), are this Day REMOVING TO LARGER PREMISES at 322, HIGH HOLBORN. Manual and Forms post free.
March 25, 1896.

SINGLE-LIFT Gasholder for Sale (Suit- able for Telescoping if required), 100 feet diameter by 24 feet deep.
SCRUBBER FOR SALE, 6 feet diameter, with Spiral Staircase, Gallery, &c. Messrs. C. and W. Walker's best make.
Apply, by letter, to No. 2648, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE URBAN DISTRICT COUNCIL OF NEWTON-IN-MAKERFIELD.

GASHOLDER FOR SALE, AS FOLLOWS.

ONE Gasholder, 40 feet Diameter and 16 feet Deep, four Guide Columns, and Wrought-Iron Top Bracing, Chains, Pulleys, and Balance Weights complete, with two 8-inch Valves, and 8-inch Inlet and Outlet Pipes.
This Holder is in good condition, and can be seen at work at the Gas-Works, Newton-le-Willows, Lancashire.
Further Particulars may be obtained by applying at the Gas-Works to Mr. Joseph Swann, Manager.
Clerk's Office, Town Hall, Earlestown,
March 23, 1896.

ISLE OF THANET GAS COMPANY.

SULPHATE OF AMMONIA.

THE Directors of the above Company are prepared to receive TENDERS for about 50 to 60 Tons of SULPHATE OF AMMONIA, for delivery between the 16th and the 30th of April next.
For Samples and Conditions of Sale and Delivery, apply to the Manager of the Company, Mr. H. H. Jones.
Tenders to be sent in on or before Thursday, April 9, addressed to the Chairman of the Company, and endorsed "Tender for Sulphate."
By order,
THOS. C. FULLER,
Secretary.
Gas-Works, The Dane, Margate,
March 28, 1896.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of the LIME required in the Purification of Gas at their respective Works during the Twelve Months from date of acceptance of tender.
Total quantity required, about 1000 Tons.
Forms of Tender, &c., may be obtained on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.
Sealed tenders, endorsed "Tender for Lime," addressed to the Chairman of the Gas Committee, must be delivered to me not later than Three p.m., on the 9th of April.
By order,
SAML. BROWN,
Town Clerk.
Town Hall, Salford,
March 24, 1896.

THE Cranleigh Freehold Land Company invite TENDERS for the supply of 100 Tons of best RIPLEY HARD SCREENINGS, delivered free at Cranleigh Station in two lots of 50 Tons each—that is, 50 Tons on May 4, and 50 Tons on July 1.

Endorsed tenders to be sent in to the Secretary on or before April 10.

The Directors do not bind themselves to accept the lowest or any tender.

STEPHEN ROWLAND,
Secretary.

March 25, 1896.

TYLDESLEY URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas and Water Committee invite TENDERS as follows:—

(*a*) For the construction of two Through Benches of RETORTS, with GENERATOR FURNACES, including Retorts, Bricks, Tiles, Blocks, Buck-Staves, Girders, and Floor-Plates.

(*b*) Twenty-four (24) Patent Faced MOUTHPIECES.

Particulars may be obtained from the Gas Engineer, Council Office, Tyldesley.

Tenders, sealed and endorsed "Tenders for Retorts, &c.," or "Tender for Retort Mouthpieces," as the case may be, to be delivered to the undersigned on or before the 7th of April next ensuing.

The lowest or any tender not necessarily accepted.

FRANK T. WRIGHT,
Clerk to the Council.

Tyldesley, March 19, 1896.

BOROUGH OF MACCLESFIELD.

THE Gas Committee are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Works during the Twelve Months commencing the 1st day of May next.

Tenders, for the Tar or Liquor separately, to be sent in not later than Saturday, the 11th of April, 1896, addressed to the Chairman of the Gas Committee, Town Hall, Macclesfield, and endorsed "Tender for Tar, &c."

For Conditions, apply to Mr. Newbigging, Engineer, Gas-Works, Macclesfield.

The Committee reserve to themselves the right of accepting any tender for the Tar or Liquor separately.

The highest or any tender not necessarily accepted.

W. FREDK. TAYLOR,
Town Clerk.

March 9, 1896.

TENDERS FOR GASHOLDER.

THE Sutton, Southcoates, and Drypool Gas Company, Hull, are prepared to receive TENDERS for a GASHOLDER, 150 feet diameter, in Two Lifts of 35 feet deep each. Also a Separate Price for the ADDING of an EXTRA LIFT, making the Holder into Three Lifts.

Makers to submit Plans, Specifications, and Prices, and to state the time delivery can be made.

Further Particulars can be had on application to the undersigned, at the Works.

Tenders, sealed and endorsed "Gasholder," to be sent to the Chairman not later than Wednesday, the 22nd of April next.

The lowest or any tender not necessarily accepted.

GEO. OLDFIELD,
Manager.

GASHOLDER.

THE Urban District Council of Hindley are prepared to receive TENDERS for a THREE-LIFT GASHOLDER WITH COLUMNS, and also ONE WITHOUT COLUMNS, for a Tank 85 feet diameter by 24 feet deep.

Makers to submit Plans, Specifications, and Prices, and state how soon they can deliver.

Further Particulars can be known on application to Mr. Dickinson, Gas and Water Manager, Hindley.

Tenders, sealed and endorsed "Gasholder," to be lodged with the undersigned not later than Monday, April 13, 1896.

The lowest or any tender not necessarily accepted; and parties tendering must do so at their own cost.

By order,
STEPHEN HOLT,
Clerk to the Council.

Offices: Cross Street, Hindley,
March 19, 1896.

MANCHESTER CORPORATION GAS-WORKS.

CARBURETTED WATER-GAS INSTALLATION.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the further work required in connection with the Carburetted Water-Gas Installation at their Bradford Road Gas Station and Land at Mode Wheel as under, viz.—

Contract No. 9: For Three CYLINDRICAL OIL-TANKS—viz., Two Oil-Tanks of 60 feet diameter, and one Oil-Tank of 50 feet diameter, with the necessary Brickwork and Stone Foundations.

Drawings may be seen, and General Conditions of Contract, Specifications, and Bills of Quantities obtained, on application (in writing only) to Mr. C. Nickson, Superintendent of the Gas Department, Town Hall.

A deposit of One Guinea (which will be returned on receipt of a *bond-fide* tender) must accompany the application for a Form of Tender in respect of each contract.

Sealed tenders, endorsed as above, and addressed to the Chairman of the Gas Committee, must be delivered at the Gas Offices, Town Hall, not later than Ten a.m. on Friday, the 10th of April.

The Corporation do not bind themselves to accept the lowest or any tender.

By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
March 25, 1896.

WATH-ON-DEARNE GAS COMPANY.

THE Directors of the above Company invite TENDERS for TELESCOPING a SINGLE-LIFT GASHOLDER, 60 feet diameter by 18 feet deep, at their Gas-Works, Wath-on-Dearne (Yorks).

Specifications, Drawings, &c., can be seen (or full copies be had on payment of 10s. 6d.) at the Office of the Engineer, Mr. Matt. Dunn, Assoc.M.Inst.M.E., Gas-Works, Selby.

Sealed tenders, endorsed "Tender for Gasholder," to be sent to the undersigned not later than Wednesday, the 15th day of April, 1896.

The Directors are not bound to accept the lowest or any tender.

By order,
T. CLARK,
Secretary.

Gas-Works, Wath-on-Dearne,
March 24, 1896.

NORTHWICH GAS COMPANY.

TENDERS are invited for the supply and delivery at Northwich Railway Station of about 4000 Tons of GAS COAL (screened, unscreened, or nuts), and about 250 tons of CANNEL during the Year ending June 1, 1897.

TENDERS are also invited for the supply and delivery of LIME and SULPHURIC ACID during the same period.

Any further Particulars required may be had on application to Mr. S. S. Mellor, the Manager.

The lowest or any tender not necessarily accepted.

Tenders, endorsed and addressed to the Chairman, must be delivered here not later than Nine a.m. on Saturday, April 11, 1896.

HENRY PICKERING,
Secretary.

Gas Office, Northwich,
March 27, 1896.

COUNTY BOROUGH OF WIGAN.

THE Gas and Electric Lighting Committee invite TENDERS as follows:—

Contract No. 1. Cast Mains and Connections.
" " 2. Wrought-Iron Tube and Fittings.
" " 3. Brass Tube and Fittings.
" " 4. Lead Pipe.
" " 5. Firing and Charging Shovels.
" " 6. Brooms.
" " 7. Wood Troughing and Covering.
" " 8. Galvanized Stove Pipe and Connections.
" " 9. Bar Iron.

The Contracts will be for One Year, commencing on the 1st of April, 1896, and ending on the 31st of March, 1897.

Forms of Tender to be obtained from the undersigned.

The Committee do not bind themselves to accept the lowest or any tender.

Tenders, sealed and endorsed with the name of the articles tendered for (a sample of which must accompany each tender), to be delivered to J. J. Charnock, Esq., Town Clerk, Town Hall, Wigan, on or before Monday, the 13th of April next.

JOS. TIMMINS,
Engineer.

Gas-Works, Wigan,
March 25, 1896.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Powers.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

GAS AND WATER STOCKS AND SHARES
IN THE
Wandsworth and Putney Gas Company.
Barnet District Gas and Water Company.
Hornsey Gas Company.
Tottenham and Edmonton Gaslight and Coke Company.
Croydon Commercial Gas Company.
Woking Water Company.
Peterborough Gas Company.
Dorking Gas Company.
Enfield Gas Company.
Uxbridge and Hillingdon Gas Consumers' Company.
Waltham Abbey and Cheshunt Gas and Coke Company.
South-West Suburban Water Company.
Kingston-on-Thames Gas Company.
Dartford Gas Company.

MR. ALFRED RICHARDS will Sell the above BY AUCTION, at the Mart, E.C., on Monday, April 20, 1896, at Two o'clock precisely, in lots.

Particulars, when ready, may be obtained at the MART, and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

BY ORDER OF THE DIRECTORS OF THE HARROW AND STANMORE GAS COMPANY.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, London, E.C., on Monday, April 27, at Two o'clock, in lots of Ten Shares each,

500 £10 "C" SHARES (fully paid)
IN THE
HARROW AND STANMORE GAS COMPANY,

ranking for a Standard Dividend of 7 per cent.; the last Dividend on the same class of Shares having been at the rate of 5½ per cent. per annum, and offering an Investment of the soundest character.

Particulars of the SECRETARY of the Company at the Gas-Works, HARROW; and of the AUCTIONEER, 18, FINSBURY CIRCUS E.C.

Fcap. 4to, Cloth, price 7s. 6d., post free.

Practical Photometry.

By William Joseph Dibdin, F.I.C., F.C.S.

LONDON: Walter King, 11, Bolt Court, Fleet St., E.C.

Price 6s., Cloth Bound,

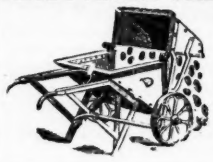
THE CHEMISTRY OF ILLUMINATING GAS.

By N. H. HUMPHRYS, Assoc. M.Inst.C.E., F.C.S.

This work contains chapters on: The Relative Cost of Light from Gas, Oil, and Candles; Products of Combustion; The Sulphur Question; The Composition of Illuminating Gas; Water Gas; Various Gas-Making Processes; Oil Gas; Properties of Fluid Hydrocarbons; Tar for Gas-Making; Destructive Distillation Condensation; and Purification.

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

ESTABLISHED 1862. **NEW GAS PLANT CEMENT**

For all Joints in connection with

TRADE MARK.

SAMPLES ON APPLICATION.

SPECIAL PAINTS FOR GAS-WORKS.

Telegrams "Enamel." Nat. Tel. 1759.

John E. Williams & Co., *Victoria Paint Works,* **Manchester.**

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

HUNTER'S

OXIDE OF IRON.

JAMES HUNTER, MINER, AND SHIPPER OF NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

5, PRINCES STREET, PORT GLASGOW.

Telegrams: "HUNTER, PORT GLASGOW."

Established 1872.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

NOTICE.

Whereas it has come to the knowledge of the INCANDESCENT GAS-LIGHT COMPANY, Limited, of Palmer Street, Westminster, that a Company called the Meteor Incandescent Gas-Light Company, Limited, a firm known as Putz and Co., and a Company known as the Evening Sunlight Incandescent Light Company or the New Incandescent Light Company, are selling, and are offering for sale, forms of Incandescent Gas-Lights called respectively the "Meteor," the "Champion," and the "Evening Sunlight,"

THIS IS TO GIVE NOTICE, THAT THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, will commence ACTIONS FOR INFRINGEMENTS OF THEIR PATENTS against all persons found dealing in any manner with the said "Meteor," "Champion," or "Evening Sunlight" Incandescent Gas-Lights, which are all constructed in Infringement of the Patent of the Incandescent Gas-Light Company, Limited.

The validity of the Company's Patent has been certified by the Hon. Mr. Justice Romer.

FAITHFULL & OWEN,
11, Victoria Street, S.W.
Solicitors for the Incandescent Gas-Light Company, Limited.

NOTICE.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, Hereby Give Notice, that they only supply their Mantles subject to the following express Conditions, which are printed and pasted on each box:—

"The Incandescent Gas-Light Company, Limited, in supplying the Mantle contained in this box, grant a Limited License to the purchaser to sell or use the same on the express condition that neither the purchaser nor any other person into whose hands the same may come shall use or sell the said Mantle except in connection, or for use, with Burners sold or supplied by the Company; any other sale or use will amount to Infringement of the Company's Patents. The Company supply Mantles for the purpose of renewals at the nominal price of 1s. 3d., subject to the Conditions and Limitations above set forth."

In the case of *The Incandescent Gas-Light Company, Limited v. Cantelo*, Mr. Justice Wills upheld the Validity of these Conditions and Limited License; and, in the course of his Judgment, said:—

The patentee has the sole right of using and selling the articles; and he may prevent anybody from dealing with them at all. Inasmuch as he has the right to prevent people from using them or dealing in them at all, he has the right to do the lesser thing—that is to say, to impose his own conditions. It does not matter how unreasonable or how absurd the conditions are. It does not matter what they are if he says at the time when the purchaser proposes to buy, or the person proposes to take a license: 'Mind I only give you this license on this condition;' and the purchaser is free to leave it or take it as he likes. If he takes it, he must be bound by the condition."

In the case of *The Incandescent Gas-Light Company v. Hirschfeld and Others*, the Honourable Mr. Justice Romer certified that the Validity of the Plaintiffs' Patents was established. Infringers in future will be liable to costs as between Solicitor and Client.

(Signed) FAITHFULL & OWEN,
Solicitors for the Incandescent Gas-Light Company, Limited.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

WARNING.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

WHEREAS, it has been brought to the notice of the INCANDESCENT GAS-LIGHT COMPANY, LIMITED, THAT DIVERS FIRMS UPON THE CONTINENT OF EUROPE are Manufacturing Incandescent Gas-Mantles, and are sending the same into this Country, and are advertising for Agents to push the sale of these Mantles,

THIS IS TO GIVE NOTICE, THAT ALL SUCH MANTLES ARE INFRINGEMENTS OF THE COMPANY'S PATENT, and that the Company will take proceedings for Infringement against all persons purchasing or using any of such Incandescent Gas-Mantles. THE COMPANY OWN THE MASTER PATENTS in this Country for the manufacture of Incandescent Gas-Mantles, and the validity of such Patents has already been certified by the Honourable Mr. Justice Romer, and the Company will enforce their Patent Rights against all Infringers.

FAITHFULL & OWEN,
Solicitors for the Incandescent Gas-Light Company, Limited.
11, Victoria Street, Westminster.

NOTICE.

The attention of the METEOR INCANDESCENT LIGHTING COMPANY, LIMITED, having been again called to the Advertisements inserted in various papers by the Incandescent Gas-Light Company, Limited, of Palmer Street, Westminster, to the effect that the "Meteor" Incandescent Gas-Lights are an Infringement of their Patents, and that they will bring Actions for Infringement against all persons found dealing in any manner with such Lights, the METEOR INCANDESCENT LIGHTING COMPANY, LIMITED, HEREBY GIVE NOTICE that they are advised that the "Meteor" Incandescent Lights in no way infringe any of the Patents of the Incandescent Gas-Light Company, Limited, that an Action has been commenced to restrain such threats, and that they are PREPARED TO FULLY INDEMNIFY ALL PURCHASERS, DEALERS, AGENTS, and USERS of their Lights against any Legal Proceedings on the part of the Incandescent Gas-Light Company, Limited.

WILSON, BRISTOWS, & CARPMAEL,
1, Copthall Buildings, London, E.C.,
Solicitors to the Meteor Incandescent Lighting Company, Limited, of 35, New Broad Street, London, E.C.

Nov. 30, 1895.

THE DRUM
FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.
See Advertisement in last and next issue.

JUNKERS' CALORIMETER
SHOWS AT A GLANCE THE HEATING VALUE OF GAS.
NO BOMB. NO ANALYSIS.
See Illustrated Advertisement in the "JOURNAL" for March 24 (second page of Wrapper).
Reduced Price £15 15s.
HERMANN KÜHNE,
25-35, New Broad Street, London, E.C.

HEBBURN MAIN GAS COALS.
Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.
For prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

LOW MOOR BLACK BED
GAS COAL.
YIELD OF GAS PER TON - 10,375 CUBIC FEET.
ILLUMINATING POWER - 17·50 SPERM CANDLES.
COKE - - - - - - - - 75 PER CENT.
Prices, f.o.r. or f.o.b., on application to
GEORGE & JOHN HAIGH,
RAVENS LODGE AND CONYERS' COLLIERIES,
DEWSBURY.
A TRIAL IS RESPECTFULLY SOLICITED.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

HOLMSIDE GAS COALS.
PRESENT DAILY PRODUCE OVER 4000 TONS.
LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.
Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.
HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.
PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.
RESULTS OF DIFFERENT ANALYSES:—
Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.
The HOLMSIDE and SOUTH MOOR COAL-FIELD possesses *a very great quantity of the best Coal*; and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*
These Coals may be bought through the Principal Merchants in England, or direct from
MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
Shipments Promptly and Carefully Executed.

London Office: R. Cull, 31, Old Broad St., E.C.

Following the acquisition of new Works situated in the heart of the cheapest Coal, Iron, and Steel Districts, we have added to our Technical Staff the MOST SUCCESSFUL MODERN EXPERTS in the designing of

AUTOMATIC
COAL & COKE HANDLING PLANTS

WE EARNESTLY WISH ENGINEERS TO INSPECT OUR LATEST DESIGNS.

New CONVEYOR Co., Ld.,
3 & 4, Lime Street Square, London, E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

BOLDON GAS COALS.
Worked by THE HARTON COAL CO., LTD.
Output about 3000 tons per day.

Analysis—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For Prices, &c., apply to the
HARTON COAL COMPANY,
LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.
Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
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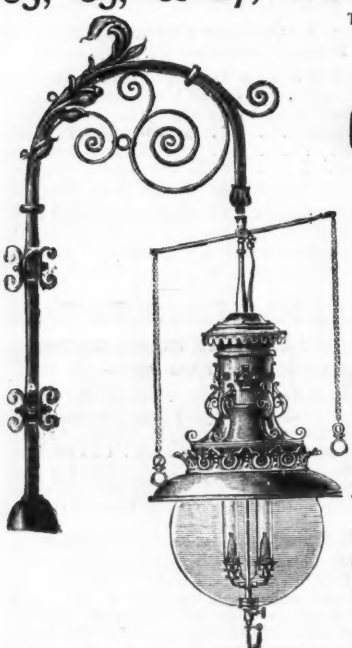
FALK, STADELMANN, & CO., Ld.,
VERITAS LAMP WORKS,
83, 85, & 87, FARRINGDON ROAD, LONDON, E.C.
Telegraphic Address: "Lamps, London." Telephone No. 6707.



Swan Neck Pendant **No. 42,281** with Lantern **No. 42,271.**

THE "VERITAS" GAS ARC LANTERNS
SPECIALLY CONSTRUCTED FOR THE
Incandescent System of Gas Lighting.
(Protected by Royal Letters Patent.)

Wind, Rain, and Dust Proof.
Enamelled Steel throughout.
Made for One, Two, Three, and Five Lights.

The undisputed great advantages of the **Incandescent System of Gas Lighting** are frequently prejudiced by atmospheric influences upon the Mantles or by sudden gusts of wind.

These deficiencies, however, have been entirely overcome by the construction of our "VERITAS" GAS ARC LANTERN, which differs from others, and which we are confident is the best yet offered.

Each Lantern is complete in itself. Therefore there is nothing to get out of order; and no skill is required in fixing.

Managers of Gas Companies will do well to apply for Descriptive Catalogue GRATIS.

STREET LIGHTING A SPECIALITY.
(Wholesale only.)

No. 42,265.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld

QUAYSIDE, NEWCASTLE-ON-TYNE.

Telegrams, "INCLINED, LONDON."

Cuttle & Graham Ltd.

THE INCLINED RETORT SPECIALISTS.

SEE OUR LATEST PATENTS

THE SUCCESS OF THE SYSTEM.

GILBERT LITTLE

MAURICE GRAHAM, A.M.I.C.E.

ENGINEERS CONTRACTORS AND **Carbonizing Specialists.**

3 & 4, LIME STREET SQ.

RIMBAULT **LONDON, E.C**

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·23 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
12, JOHN STREET, ADELPHI, LONDON, W.C

Price 21*s.*, *Post Free*,

PRECEDENTS IN PRIVATE BILL LEGISLATION

AFFECTING GAS AND WATER UNDERTAKINGS, 1879-90.

Compiled by E. H. STEVENSON & E. K. BURSTAL.

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STOURBRIDGE RETORTS AND FIRE-BRICKS.

BEST QUALITY.

KING BROTHERS, STOURBRIDGE.

[See Illustrated Advertisement, March 3, p. 484.]

ARROL-FOULIS

Patent Automatic Machinery

FOR

DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,

GLASGOW.

[See Illustrated Advertisement, March 3, p. 441.]

MOBBERLEY & PERRY

STOURBRIDGE.

Manufacture & supply best quality of

Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c. &c.

EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.

Contractors for the erection of Retort-Benches complete.

London Agents:

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WILLEY & CO.,

GAS ENGINEERING CONTRACTORS,

EXETER,

For **GASHOLDERS** and all kinds of **ENGINEERING APPARATUS.**

For **WET** and **DRY GAS CONSUMERS' METERS.**

For **COIN METERS,** their Patent Automatic is admitted to be one of the best and most reliable in the Market. Largely used in the Metropolis.

For **GAS-FITTINGS,** Registered Designs in Extensive Variety.

Manufacturers of the **LIVESEY WASHER.**

Agents for the **MAXIM CARBURETTOR.**

New Works, 5 acres in extent, recently opened in the City of Exeter for the Manufacture of every kind of Apparatus used in the Production, Distribution, and Sale of Gas.

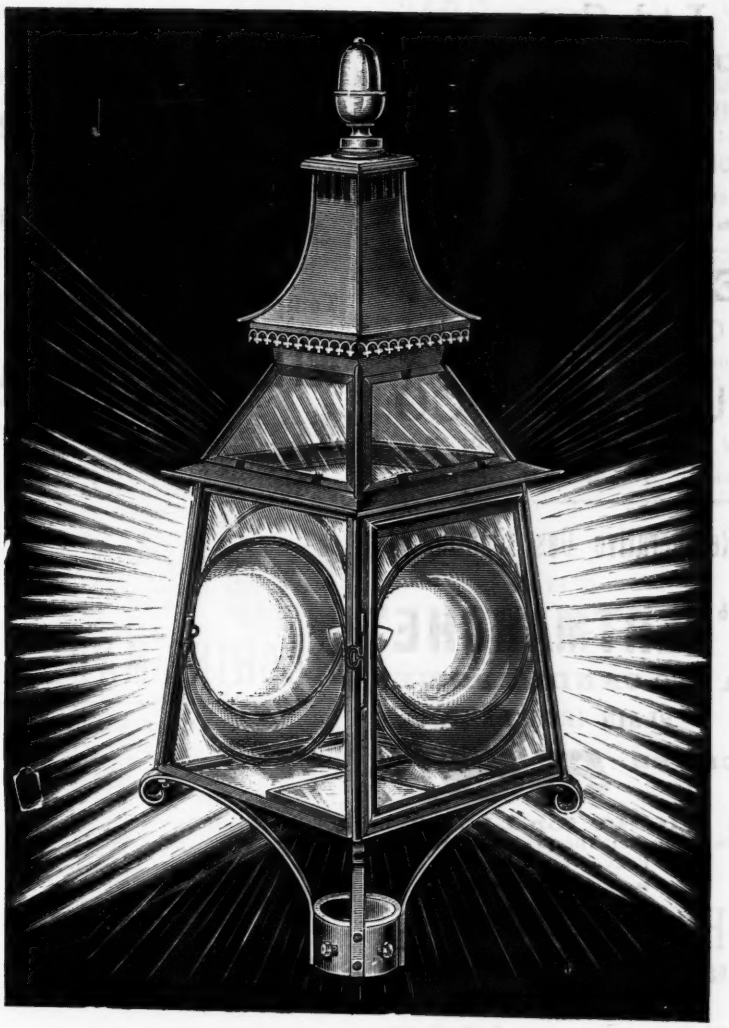
Telephone 132. **Telegraphic Address: "Willey, Exeter."**

ESTABLISHED 30 YEARS.

"LOFTUS"

PATENT STREET-LANTERNS

100
PER CENT.
MORE LIGHT
CAN
BE OBTAINED
FROM
ANY FLAME
BY
USING
THIS
LANTERN
INSTEAD OF
THOSE
NOW USED.



No. 420 G.

PUBLIC BODIES,
CORPORATIONS,
AND
GAS COMPANIES
CAN SAVE
50 PER CENT.
BY USING
THIS
LANTERN
FOR
STREET
LIGHTING.

Can be fitted for
OIL
where required.

FIRST COST LITTLE MORE THAN ORDINARY LANTERNS.

Exceedingly Brilliant Light in direction of Lenses,
Lights Footway all along between Lamps.

For Further Particulars, inquire for PRICE LIST "L" from

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Or from London Agent: J. JONAS, 38, Lime Street, E.C.,
where a Specimen Lamp can be seen.

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SPECIALITIES: Incandescent Lamp Burners and Mantles (with or without electric lighting from any distance, by button from the wall, etc.).

INCANDESCENT SPIRIT LAMPS.
Electro-technical Wares of all kinds.
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MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
Established 1860.

OXIDE OF IRON.
NATURAL BOG ORE FROM OWN MINES.
Samples and Prices on application.
Wm. H. MÜLLER & CO.,
81, PALMERSTON BUILDINGS, LONDON, E.C.
TRADE MARK: "Compascum." Telegraphic Address: "FERRUM."

The Climax of Regenerative Gas Lighting!!

THE
"VERTMARCHE"
A 280-CANDLE POWER
PLAIN IRON LAMP,
CLASS A— **55/-**
LIGHT for LIGHT
less than half the price of any other Regenerative Lamp.
Manufactured in England.
HENRY GREENE & SONS,
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LONDON BRIDGE, E.C.
PARTICULARS AND PRICES FREE. AGENTS WANTED.

GAS & WATER PIPES
AND
CASTINGS OF EVERY DESCRIPTION.
MANUFACTURED BY THE
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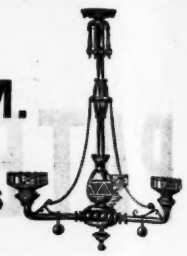
MANUFACTURERS OF GASELIERS IN GLASS AND METAL.



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GAS COAL AND CANNEL FACTORS,
Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.
ADDRESS CHIEF OFFICES:
Temple Buildings, 50, New Street, Birmingham.

WILLIAM INGHAM & SONS,
Incorporated with the Leeds Fire-Clay Company, Ltd.,
WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—
1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

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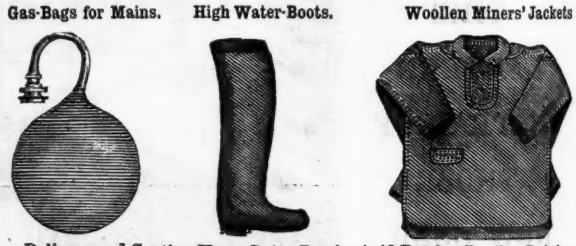
MACHINE-MADE GAS-RETORTS.

Gas-Bags for Mains. High Water-Boots. Woollen Miners' Jackets



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Write for Price List to
THOMAS BUGDEN, Manufacturer,
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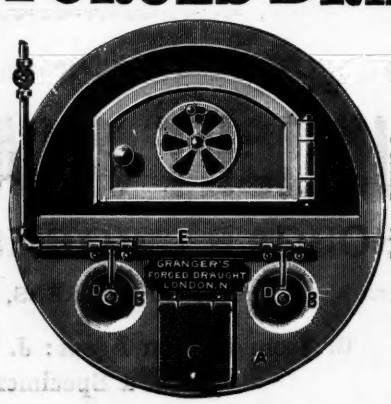
FORCED DRAUGHT



GRANGER'S
FORCED DRAUGHT
FURNACE
Can be applied to any type of Boiler, and Burns all kinds of Cheap Fuel, Slack, Smudge, Pan Breeze, &c., also gives a large increase of Steam.
Many hundreds working at the leading Collieries, Mills, Factories, &c., &c.
WM. GRANGER,
BROOKE ROAD,
STOKE NEWINGTON,
LONDON, N.

ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

MESSRS. HUMPHREYS & GLASGOW

Have constructed their EUROPEAN type of

CARBURETTED WATER-GAS PLANT

At the following Gas-Works:—

Copenhagen	700,000 Cub. Ft.	Liverpool	2,500,000 Cub. Ft.
Belfast	1,700,000 ,,	Tottenham	600,000 ,,
Glasgow	300,000 ,,	Brighton	1,250,000 ,,
Brussels	700,000 ,,	Bath	1,000,000 ,,
Santiago	400,000 ,,	New York	1,000,000 ,,
Swansea	700,000 ,,	Newburgh, N.Y.	350,000 ,,

And have now under Contract:—

Belfast (Second Contract)	3,500,000 Cub. Ft.	Manchester	3,000,000 Cub. Ft.
Preston	1,500,000 ,,	Brussels (Second Contract)	700,000 ,,
Southport	750,000 ,,	St. Joseph, Mo.	750,000 ,,
Tottenham (Second Contract)	750,000 ,,	Holyoke, Mass.	500,000 ,,

In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.

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THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.
LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.
TELEGRAPHIC ADDRESS: "PARKER LONDON."

Special Notice

TO GAS COMPANIES AND DISTRICT COUNCILS, ARCHITECTS, BUILDERS, AND CONTRACTORS.

The CHAMPION INCANDESCENT GAS-BURNER.

BEST LIGHT AT LOWEST COST.

We beg to advise our numerous friends and customers that the Champion Incandescent Gas-Burner still holds the field, and that our sales are increasing daily, notwithstanding the threats of our competitors.

Mantles are sold in any quantity without restriction for use of particular kinds, and are very durable.

F. J. PUTZ & CO.,

Temporary Premises: 16 & 17, GREAT ST. HELENS, LONDON, E.C.

Telegraphic Address: "PUTZ, LONDON."

Several large Show-Rooms will shortly be opened in different Districts. All Agents and Buyers are fully indemnified against Law Proceedings. A few more Agents wanted in several Districts.

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

CLAYTON SON & Co LTD

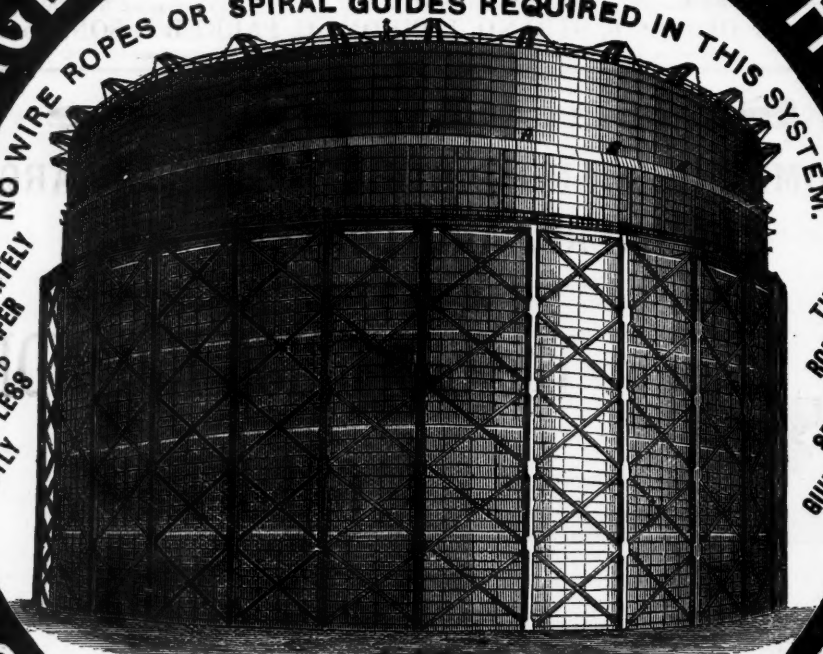
MAKERS OF

WORKS LEEDS

THE LARGEST GASHOLDER IN THE WORLD

GASHOLDERS OUR SPECIALITY

NO WIRE ROPES OR SPIRAL GUIDES REQUIRED IN THIS SYSTEM.



INFINITELY SAFER AND FAR LESS COSTLY THAN ROPES OR SPIRAL GUIDES.

CAPACITY 12 MILLION CUBIC FT.

ERECTED AT EAST GREENWICH FOR THE South Metropolitan Gas Company IT HAS SIX LIFTS 30 FT DEEP EACH AND IS 300 FT DIAR

MAKERS OF GAS PLANT OF EVERY DESCRIPTION

ROOFS PURIFIERS &c. ALSO

ADDRESS LONDON 60, QUEEN VICTORIA ST.

TELEGRAPHIC "GAS, LEEDS."

GASHOLDERS OF ANY SIZE

ERECTED & COMPLETED WITHIN 12 MONTHS AND AT THE TIME SPECIFIED

HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF

BEST FIRE-BRICKS, GAS-RETORTS,

LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.

Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.

ESTABLISHED 1836.

JOSEPH CLIFF & SONS,

INCORPORATED IN

THE LEEDS FIRE-CLAY COMPANY, Ltd.,

WORTLEY, LEEDS.

LONDON OFFICES & DEPÔTS:

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WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.

LIVERPOOL:

16, Lightbody Street.

LEEDS:

Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

GODDARD, MASSEY, & WARNER'S

IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

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ENGINEERS,
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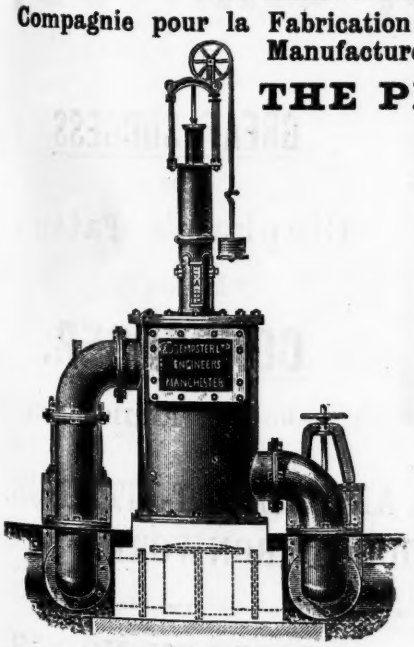

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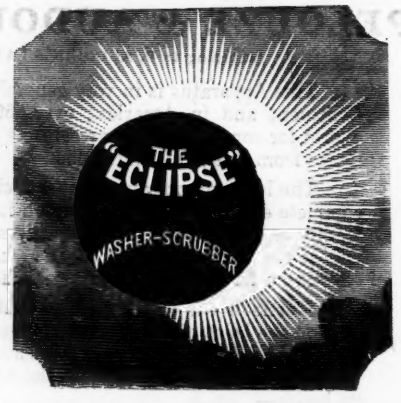

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